THE LAWS OF AERIAL WARFARE

# POPULAR AVIATION

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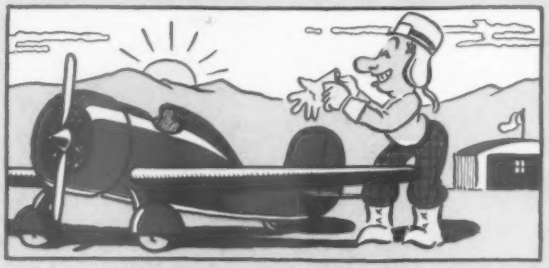
BILLION DOLLAR SHOPPING TOUR — THE ALLIES BUY U. S. WARPLANES

*The Deadly Show-off* ★ MYSTERY AIRFOIL

# DON'T BE A SCREWBIRD!

## *Whether or Not You're an Instrument Pilot - - - Check Your Weather!*

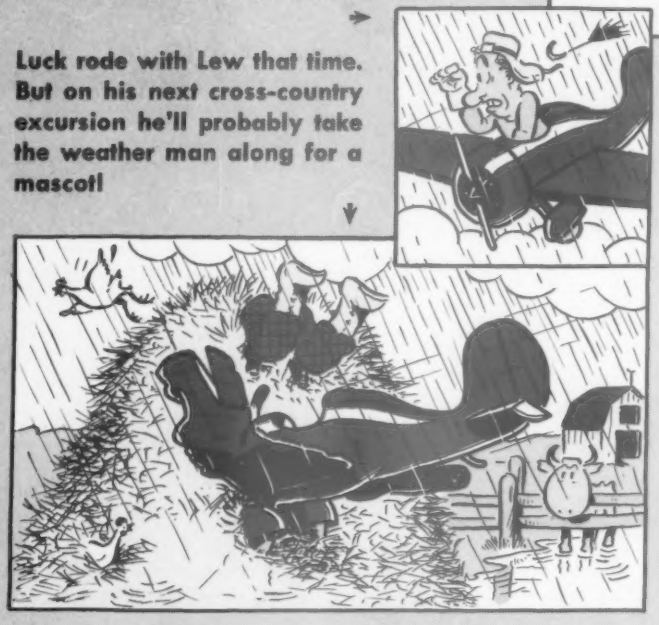
**Everything is just lovely as Lew Screwbird takes off on a cross-country jaunt . . .**



**But Lew was careless about checking weather reports. Now he finds himself heading into some pretty dirty weather, and Lew is no "blind" flyer, either.**

**Wow! Lew's really on his own and flying by the seat of his pants. The only instrument he can use is his rabbit's foot!**

**Luck rode with Lew that time. But on his next cross-country excursion he'll probably take the weather man along for a mascot!**



***"INSTRUMENT FLYING during adverse weather conditions should be attempted only by those adequately trained in this type of flying," says the Air Safety Board. In other words, take a tip from the birds and stay on the ground if you get adverse weather reports, either immediate or up ahead.***

NO matter what the weather, wise pilots have found a *balanced* gasoline is needed for better all-round performance.

Why not follow the lead of experienced flyers—both commercial and private—who have found in Shell Aviation Gasoline a fuel that gives quick starting, instantaneous response to the throttle during take-off and climb, and, for greater economy, low fuel consumption.

Call on Shell—the first company to develop 100-octane fuel commercially—for answers to fuel and lubrication problems. Shell Aviation Dept., 50 W. 50th St., N.Y.C.; Shell Bldg., San Francisco; Shell Bldg., St. Louis.

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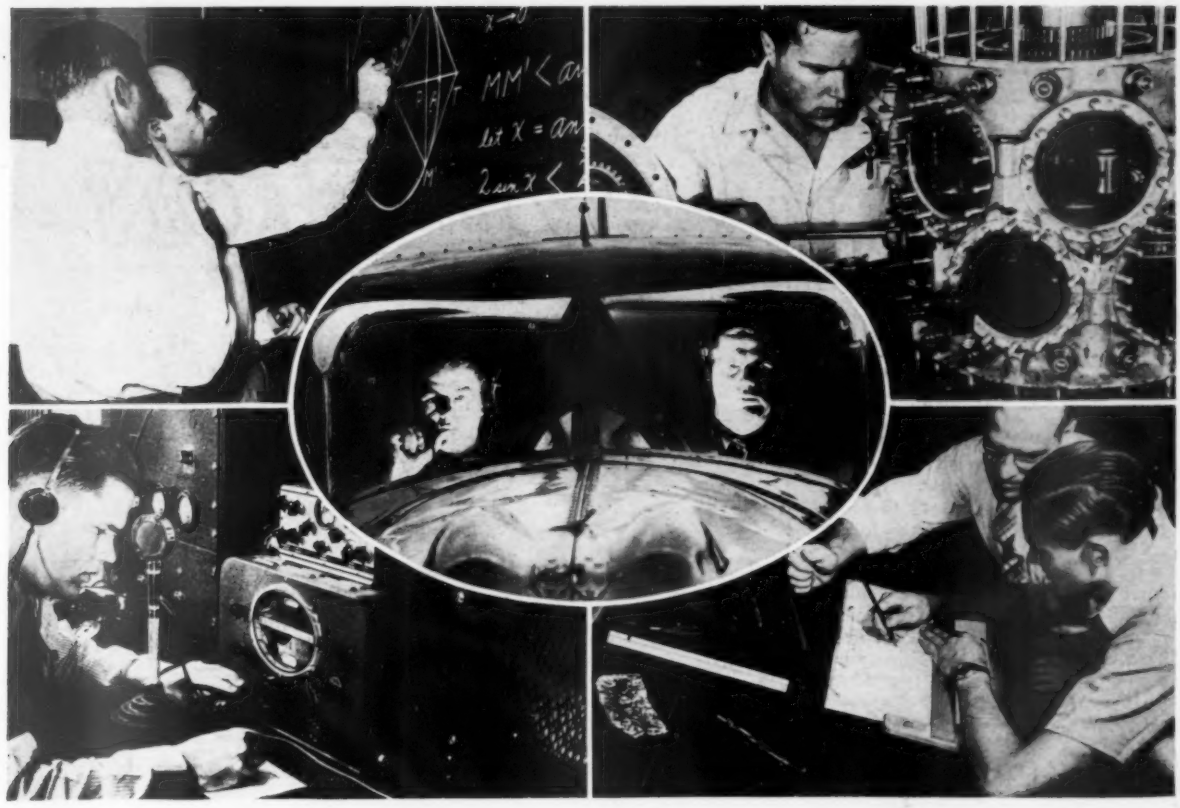

# PARKS Prepares You for Leadership in Aviation by Training You to Think for Yourself . . .

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If your goal is to advance far beyond routine work, to develop your own capacity for leadership, it will pay you to get all the facts about Parks. Four complete courses are offered; Professional Flight and Executive, Aviation Operations and Executive, Maintenance Engineering and Aeronautical Engineering. Mail the coupon today for complete information on each of the courses. The catalog will be sent you free of charge or obligation.

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**PARKS AIR COLLEGE** East St. Louis, Illinois

MANY of us are inclined to get fidgety as one late-model warplane after another is released by the U. S. Government for purchase by the Allies. It's a situation American aviation people may have trouble understanding but, once analyzed, makes sense. Very few military aircraft are, in themselves, military secrets. Every airplane must combine certain established factors—factors that are common knowledge and available to anyone—in order to fly. Our latest warplanes, like those of Britain, France, Germany or Italy, basically are identical. They all have wings, fuselages, tail assemblies, engines and landing gears. Once in a great while something worth guarding as a military secret is developed in one of those basic categories. Example is the new airfoil being used on the Army Air Corps' latest bomber, the XB-24 (see page 36). But, with the exception of a rarity like the Davis airfoil, the only secrets any warplane contains are devices used on that plane: engines, armament features and, of course, bomb sights. The latest American warplanes going to the Allies include no secrets of this nature. The brand new Grumman XF5F-1 (see page 56) was released to the French before we had heard of it, despite the fact that it basically is a fighter for the U. S. Navy. American Navy and Army aviation men *want* the Allies to get our latest warplanes. One condition on which they approve these exports is that the British and French supply American military authorities with detailed descriptions of how our planes perform in actual warfare. This data is used to perfect aircraft used by the U. S. Army and Navy. So we needn't be too concerned over the fact that the Allies will have the Bell P-39, Lockheed P-38, Curtiss P-40 and whatnot before our own air forces; we already have superior aircraft on the drawing boards.

* * *

ALTHOUGH we got a great kick out of the fact that the airlines of the United States recently completed a whole year without a single passenger or crew fatality, we can't quite fathom the psychology the airlines themselves are using on this score. They gleefully boast of the record, as though it's a miracle some one wasn't killed between March 26, 1939, and March 26, 1940. Not in common with *any* form of surface transportation, we see no reason why American airlines shouldn't chalk up two, five or 10 years without killing anyone. Their one-year record wasn't

(*Concluded on page 97*)

POPULAR AVIATION
Trade-mark Registered

Volume XXVI Number 6

# Contents

JUNE, 1940

| | | |
|---|---|---|
| The Guns Grow Larger | Leonard Engel | 10 |
| Billion Dollar Shopping Tour | James Bassett, Jr. | 12 |
| War Giant | | 15 |
| There's Grief in Them Thar Hills | Tex Rankin | 16 |
| Flying and Nerves | Lewin B. Barringer | 18 |
| The Laws of Aerial Warfare | Edward Lawson | 20 |
| Eagles With Clipped Wings | Kurt Rand | 22 |
| Workhorse Squadron | Frank Cunningham | 24 |
| Push-Puller | Ernest A. Foster | 27 |
| Homemade Hero | Richard Martin | 29 |
| Soup's On! | DeWitt Wendell | 30 |
| The Wail of Two Cities | Edward Fisher | 33 |
| I Learned About Flying From That!—No. 14 | Lieut. W. A. Burton | 35 |
| Mystery Airfoil | Harold Keen | 36 |
| The Deadly Show-Off | John C. A. Watkins | 38 |
| Aviation's Patron Saint | Edward Churchill | 40 |
| Cloud Club | Tom R. Taylor | 43 |
| POPULAR AVIATION Data Book | | 44-52 |
| Killer | | 53 |
| AOPA News | | 54 |
| Aircraft With Rotary Wings | Raoul J. Hoffman | 55 |
| Have You Seen? | | 56 |
| This Month's Model | Paul W. Lindberg | 58 |

*Cover Photograph by Cy La Tour*

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# ZOOM into Aviation

**IN THE VERY CENTER AND A VERY IMPORTANT PART OF SOUTHERN CALIFORNIA'S GREAT AIRCRAFT INDUSTRY IS LOCATED CURTISS-WRIGHT TECHNICAL INSTITUTE.**

Established in 1929, in twelve years this famous school has come to be recognized as the nation's leading institution in the training of Aeronautical Engineers and Master Mechanics. Mr. Donald Douglas, President of the great Douglas Aircraft Company, chose this school for his own son's training which pointedly indicates the high standing this school has attained in the aircraft industry.

You, who plan to invest in a course of career training to prepare yourself for the future, must determine in advance what the returns will be on your investment before you put cash on the line. This is imperative since your choice of a school in which to take your training will determine how much money you will make all the rest of your life. Your whole future in aviation depends on your training.

Curtiss-Wright Tech's career training is carefully designed to do just one thing:—TO MAKE MORE MONEY FOR YOU so upon graduation you can be independent and self-supporting for life. For years and hundreds of successful graduates have proven that Curtiss-Wright Tech training gets results and always pays. It has provided them with a profitable occupation and secure future since it trained them in advance for the highest position they could ever expect to occupy. It can do the same for you.

Aviation needs trained men. They are in demand and at a premium. Advancements for them are rapid, especially here in Southern California where there are over $234,000,000.00 in unfilled aircraft orders on hand and where over fifty per cent of all aircraft manufactured in the United States is made. You can get in on the ground floor by training now. BUT you must choose the right school for your training.

Our graduates are obtaining immediate employment and the demand for them far exceeds the supply. We honestly believe that every student who enrolls here will be able to obtain with our assistance, immediate employment upon graduation. This school has never guaranteed or promised positions for its graduates, but practically every graduate has obtained immediate employment and all are advancing steadily.

WARNING!—"don't miss the Boat." The greatest opportunity of your lifetime exists today! There never was such an opportunity in aviation for you! there may never be another. A position awaits you. Insure for yourself a steady income and independence for life. Send in your enrollment today before you "miss the boat."

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DON'T "MISS THE BOAT" — MAIL THIS HANDY COUPON TODAY

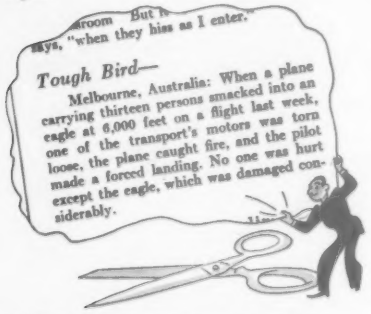
# The Birdmen's Perch

**One thing we're strong for is giving credit where credit is due. Pennsylvania-Central Airlines has just begun its 14th year of operation. The Anniversary is noteworthy, for throughout that span, there has been *no fatality to passenger or crew member*. So, in our official capacity as Editor of the Birdmen's Perch, we hereby doff our helmet and bow very low to this unique record. And, as Manager of Gulf's Aviation Department, we want to say that we're downright proud that they've used our products for six years of that time—and since 1938 used them exclusively!**

**MAJOR AL WILLIAMS, alias "Tattered Wing-Tips," Mgr. Gulf Aviation Products, Gulf Bldg., Pittsburgh, Pa.**

## DOWN MEMORY LANE

Some of you veteran Perch fans may remember that back in December, 1937, a correspondent asked what happened when a bird tangles with a propeller. Whereupon half our readers promptly tangled with the other half in an argument that lasted till we called it off for lack of evidence in September, 1938. New evidence recently appeared in a *Newsweek* magazine paragraph reproduced below. Looks like both the "goodbye-bird" and the "goodbye-motor" factions were right.



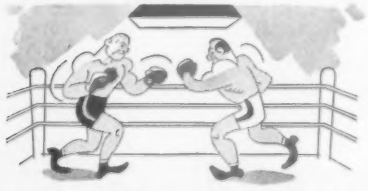
...room But it
says, "when they hiss as I enter."

*Tough Bird—*

Melbourne, Australia: When a plane carrying thirteen persons smacked into an eagle at 6,000 feet on a flight last week, one of the transport's motors was torn loose, the plane caught fire, and the pilot made a forced landing. No one was hurt except the eagle, which was damaged considerably.

## MORE-THAN-MEETS-THE-EYE DEPT.

Ever notice how two fighters can look absolutely evenly matched until the bell rings? Then one will absorb punishment like a sponge while the other folds almost under one punch.



Oils are like that, too. They look alike, but there's no end of difference in their stamina. *The reason?* Just like with fighters, it's the way they're trained down or refined.

That's why we recommend Gulfpride Oil as *the* oil that can take it! For Gulfpride is refined not only by conventional methods but also by the Gulf-invented Alchlor process that works out up to 20% more surplus waste and sludge. And when you refine a 100% Pennsylvania that thoroughly, you've got a lubricant that can lick friction to a standstill!

## FIGURE-SHARKS ONLY

A pilot with a fifteen-passenger plane offered to take a high school class of 30—15 boys and 15 girls—for a ride. When they reached the airport, it was discovered that time would not permit more than one flight, hence half the class were out of luck. Hearing the teacher and principal decide to line the class up and count out every ninth pupil till only 15 remained, the star mathematician immediately figured out what places the boys should preempt so that every girl would be left on the ground. Can you do it?

We've got the right answer handy, so send in yours to Professor Wing-Tips to be checked.

## THIS MONTH'S WHOPPER

Dear Major:

Here is a story that I suppose you will have to publish as a whopper though it is as true as most of the stories we read in the papers about planes.

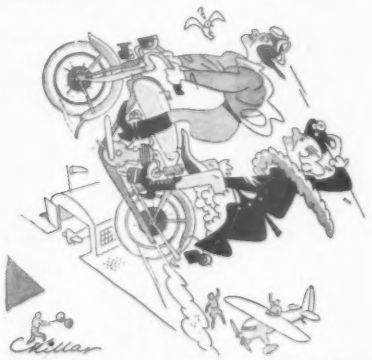
As we all know, airplanes need a good, high-test and high-octane gasoline like G.A.G (Advt.) But what most people don't know is that motorcycles do also. But maybe I better get into my story.

Last Sunday—a bright, sunshiny day—I was breezing along on my puddle jumper when to my disgust, dismay, etc., I had the experience that always befalls gents who take—not their best girl—but their mother-in-law out for a spin. You guessed it, I ran out of gas on a lonely road.

Well, sir, there was nothing for me to do but push popcycle and battle axe to the nearest source of gas, the local airport. When I got there, I found the only fuel on sale was Gulf Aviation. So, not without crossing my fingers against getting put out of even the dog house, I filled her up.

Then I wheeled her over to the runway, Old Frozen Face climbed on back, and I stepped on the starter.

Major, before I even knew what was coming off, we were off! Raced down the runway, took to the air, and headed for the moon. To give the old girl credit, she never peeped. Just hung on and let me do the thinking.



Having read some time ago that the first planes were controlled by shifting the pilot's weight, I leaned to the right and cut the switch. Believe it or not, we came out of that tight turn with exactly enough speed to glide five miles back to the airport. You see, those tilted footboards got too much pressure under them and lifted popper, m.i.l. and me in under a fifty-foot run.

Now here's the trouble, Major; also the blessing. I don't have a solo license, so the C.A.A. won't let me develop my new G.A.G. flyingcycle without some dual instruction. And every cent I had saved went for railroad fare for my mother-in-law who left next day to live with my brother in California.

All contributions gratefully received—larger ones in proportion.

**Paul F. Metzger**

**Gulf Oil Corporation and Gulf Refining Company . . . makers of**

GULF **GULF AVIATION PRODUCTS**

# Ostriches Also Have Wings...

AGES ago during the process of evolution the ancestors of the ostrich not only flew, but had plenty of opportunity to develop into good flyers. In the eons of time which have elapsed since then the ostrich drifted into an environment that "cramped its style!" And so today the ostrich has wings but cannot fly.

The Aircraft Owners and Pilots Association is aware that a similar fate could befall the non-scheduled pilot if opportunities for developing and preserving non-scheduled flying are not substantially improved.

If you are a non-scheduled pilot who has soloed or a private aircraft owner, you should register with the AOPA, the largest and most progressive organization of its kind in the world. Your interests are our interests! The fulfillment of your needs is our objective!

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**NEW JEWEL CASE INDIRECTLY LIGHTED PANEL** has space for blind flight instruments. Plastic control knobs are grouped and recessed to avoid projecting knobs. Note wide doors, headroom, new switch location.

**REAR COMPARTMENT** is exceptionally large, contains a removable, deeply padded seat. There is ample room for baggage and golf clubs. Note larger front seats in Laidlaw upholsteries. Pilot's seat adjustable.

**EXCELLENT VISION** and fine accommodations for 3 persons. See improved cabin ventilators, redesigned windshield, hinged auto-type hood for accessibility.

**YVONNE GILLESPIE**, one of America's loveliest models, poses before the beautiful new "105". The new "105" sells for only $3295.00* at Wayne, Michigan. Note delightful new nose grilles, new name plate, striping and wide landing gear. Low cost finance plan available. *(Federal Taxes included. State and Local Taxes not included).

**THE "105"**, on left, operates with automobile economy, yet has the advanced design features which make the 1940 Stinson "Reliant" famous.

**STINSON AIRCRAFT DIVISION— Wayne, Mich.**

**Send me free copy Stinson Plane News. I $\frac{\text{am}}{\text{am not}}$ interested in buying a plane this year.**

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*Address*_____

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**ATTENTION—MODEL BUILDERS—**

**If you wish a large Stinson "105" model kit with instructions for building actual flying model of this famous plane, fill out and mail this coupon today. You will also receive Stinson Plane News. Enclose only $1.50 with coupon. Mail to Stinson Aircraft Division—Wayne, Michigan.**

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Polly Smith Photo.

# HE WANTS WINGS

The wings he covets are not made of feathers. They are the taut fabric wings of a training plane.

Like many other alert Americans, this young man has chosen aviation as his career and is learning to fly at the Dallas Aviation School.

When he completes his training, he will be prepared to follow his chosen profession and take his place in the fast expanding aviation industry.

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This four-machine-gun nest protects the tail of a British Armstrong-Whitworth "Whitley".

# THE GUNS GROW LARGER

## By LEONARD ENGEL

**Lesson learned in the current war in the air is that more powerful armament will be the decisive factor. Hence the trend toward many machine guns and cannon.**

TWENTY-FIVE years ago, during World War I, it quickly became apparent that a few machine gun bullets were ample to knock down most of the warplanes then in service. Bombers or pursuits, they were relatively fragile and pilots had little protection. The fancy artists, whom the world has chosen to call aces, made a point of honor of potting enemy ships with as few shots as possible. Men like Boelcke and Von Richtofen often came back, another plane bagged, with all but a dozen cartridges still in their feed belts. Aerial gunnery resembled sniping.

This state of affairs continued until a few years ago. But since then a lot of things have happened to guns and the planes at which they are meant to shoot. The rifle-caliber machine gun of classic vintage is on its way out. The coming of a day when the machine gun, or even eight of them, would rank behind any other weapon as a killer would have been hard to believe in 1930. But that day is here. Blame it on World War II and its lessons in blood. A revolution in armament, as far-reaching as the one the late Tony Fokker caused when he made a propeller fire machine gun bullets between the blades, is under way.

Armor-plated cockpits, introduced as a regular practice by France's Armée de l'Air and due for general use before the year is out; better protection for pilots by sturdy engines which serve as shields as well as power plants, puncture-resistant tanks, more rugged planes, higher speeds and other factors are combining to put heavier guns in the machine gun's place. This is not to say that heavier guns have not been used before. But they have never been so general as now and tomorrow they will dominate every aerial arsenal.

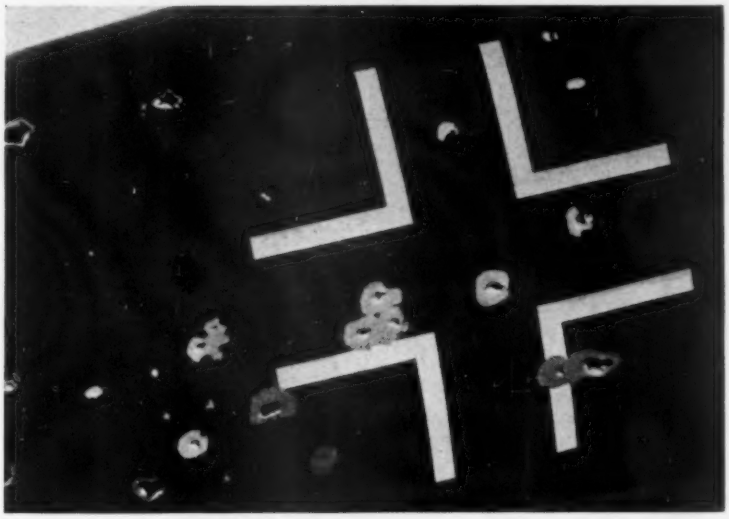
These armorers are loading one of the eight .303 caliber machine guns on a British Supermarine "Spitfire" pursuit plane.

Above, a British fighting pilot tests his marksmanship on a practice range. Trend in Europe is away from guns firing through prop.

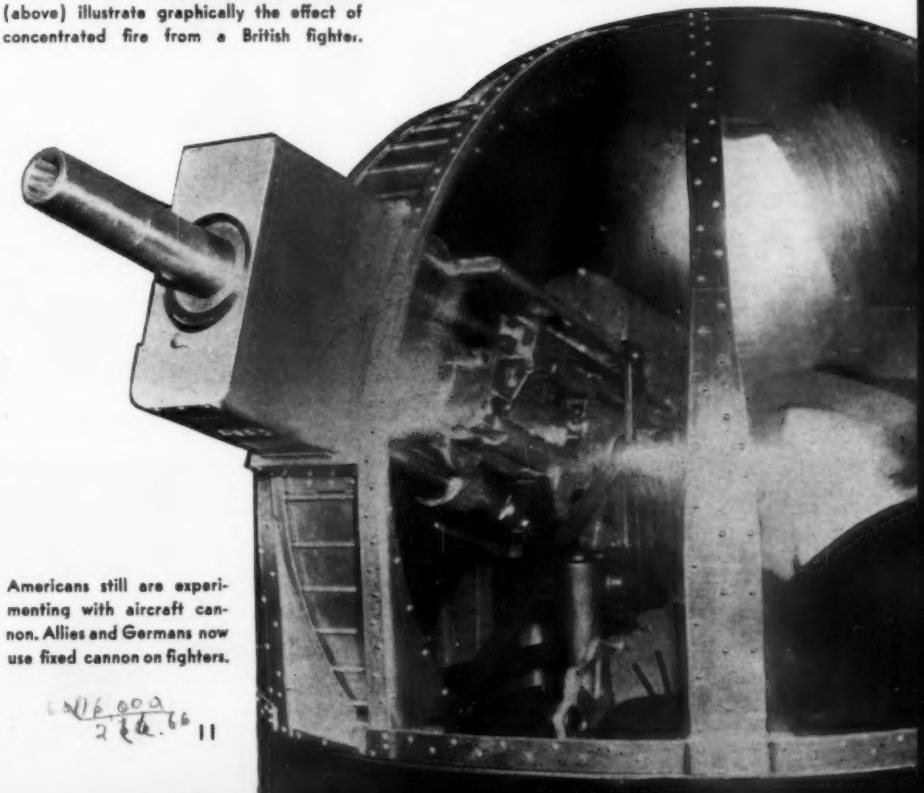
Small-bore machine gun armament has been developed to a high level of efficiency and multi-bullet deadliness in the last few years, particularly in Europe. While American Army pursuits have stuck until recently to a pair of synchronized guns (one .30 and one .50 caliber), Europe has been rapidly multiplying its guns. Hawker *Hurricanes* and Supermarine *Spitfires* mount eight Browning .30 caliber guns apiece. Curtisses in the service of France use four and six Chatelleraut, Daine or Hotchkiss guns. German Heinkels and Messerschmitts have four .312 Knott-Bremse weapons. Rates of fire have gone up from the 600 or 700 a minute of World War I days to the 1,250 a minute of the English Browning in service. A new (English) Vickers, the Model J, fires 1,500 shots a minute; a Browning type made by Belgium's Fabrique National (the National Arsenal), 1,800 a minute. Guns have been moved from the propeller disc which slows rate of fire, out to the wings to take advantage of the more-bullets-per-minute they now can fire. The result has been tremendously effective fire volume: hit your enemy with more slugs in less time than he can pour at you. He wh gets there first with the most bullets wins. Arrangement of fixed guns to have a converging field of fire gives a "focus of fire." Bullets are so dense, if the target is caught at that point, that the target is almost literally cut apart. Beyond that point—usually three-quarters to five-sixths of the effective range—the scattered field of fire enables even an amateur to hit something vital now and then

But even such well arranged and heavy fire volume—167 shots a second or a rate British fighters—cannot cope with quar of 10,000 a minute from the eight-gunned ter inch armor steel lining of the back and bottom and sometimes the sides as well, of the cockpit. Rifle-caliber bullets just bounce off such armor. Nor can ball ammunition make a plane with properly designed raw rubber bonded tanks lose enough gas in a hurry to affect the issue of battle immediately. For good and sufficient reasons of chemistry which we need not go into here, such tanks are frequently difficult to set on fire with tracers—particularly when they are full. Plane structures, particularly mono-

(*Continued on page* 68)



Bullet holes in a shot-down Heinkel bomber (above) illustrate graphically the effect of concentrated fire from a British fighter.



Americans still are experimenting with aircraft cannon. Allies and Germans now use fixed cannon on fighters.

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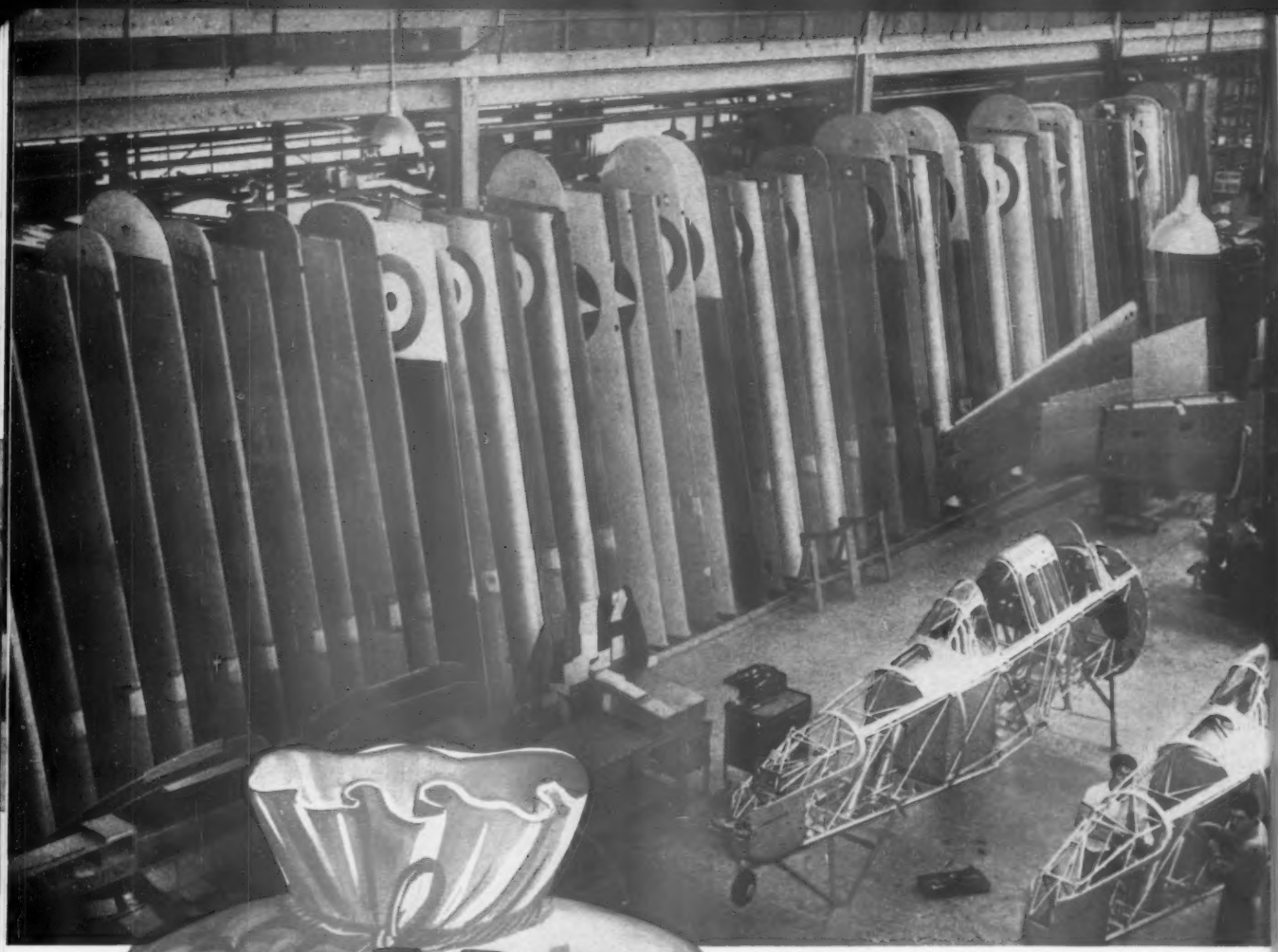


Stacked and awaiting final assembly are these wings for both Royal Air Force and U. S. Army North American trainers.

# BILLION DOLLAR SHOPPING TOUR

By
**JAMES BASSETT, Jr.**

***France and England are buying U. S. military planes by the thousands.***



Just released for Allied purchasers is an export version of the Bell P-39. The U. S. Army and Navy will get only a few.

Highly popular on the western front is the Curtiss P-36. Now released to Allies is improved version with powerful Allison.

**The British ordered approximately 400 Lockheed "Hudsons". Above are seven of these ships on the deck of a British freighter. The Allies are expected to order many of the Lockheed P-38 fighters.**

ON her young lap America's aviation industry held (at the moment this article was emerging from the typewriter) a $625,000,000 infant. He was a precocious child, lusty and yelling and growing like a circus giant. While his slightly embarrassed mother coddled him dubiously his father, all business, hustled about with schemes which boded well to add years and poundage to this baby.

As you read this issue of POPULAR AVIATION the infant no longer is a mere $625,000,000 offspring. He is a billion-dollar baby—*plus!* The task of raising such a son isn't an easy one. For instance, the child's critical Uncle Congress—a many-minded gentleman—recently began to ask whether Junior wasn't getting somewhat fat. Then his liberal Uncle War Department, a kindly duffer given to wearing red tape decorations, differed with this viewpoint. Let the kid alone, he ordered; he's doing swell. He's a good example for my own wobble-kneed boy, Home Defense, who's a mere $300,000,000 baby—and undernourished at that.

Finally the butcher's delivery helper, whose name was Engine-Builder, began to raise Cain. Aviation was giving him a headache. Too much work, too many deliveries to make and not enough time to make them in.

But here let's leave parable and get down to brass tacks . . .

Assuming Europe—and by Europe we mean the United Kingdom and France—gets the green signal on its gigantic $1,000,000,000 procurement plan (they just have.—Ed.), what then? You know what these contracts stipulate. Your daily newspapers have screamed the general outline of the project for weeks. Eight thousand warplanes roughly divided into bombardment and pursuit classifications, with a tidy batch of trainers included.

In addition to the 4,000 craft which today form the spinal column of many an American factory's whopping backlog, the new 8,000 will specify *brand new* types, not obsolete crates or even 1938 models.

They have cash. Perhaps money will talk. If it talks the language they hope it will, the Allied Purchasing Mission, which has been closeted for many a weary week with Federal bigwigs in Washington, will get such lightning-fast pursuit ships as the Curtiss P-40, late Douglas attack-bombers and the twin-engined Lockheed P-38.

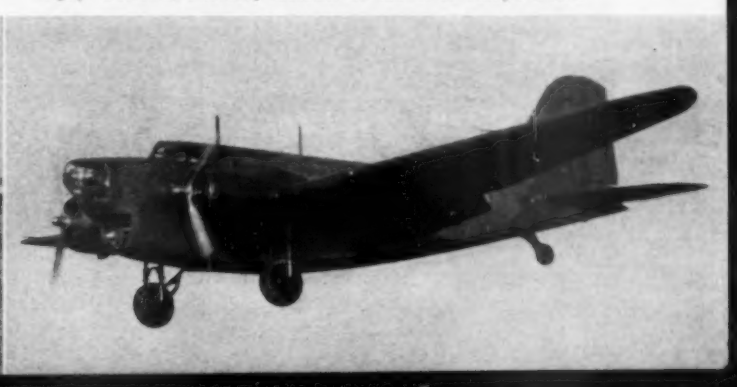
Here's where Uncle Congress enters. He wants to know why the P-38, for example, stands today on the "approved-for-export" list—for eligible purchasers. He hints that our own 5,500-plane expansion program has been side-tracked almost indefinitely.

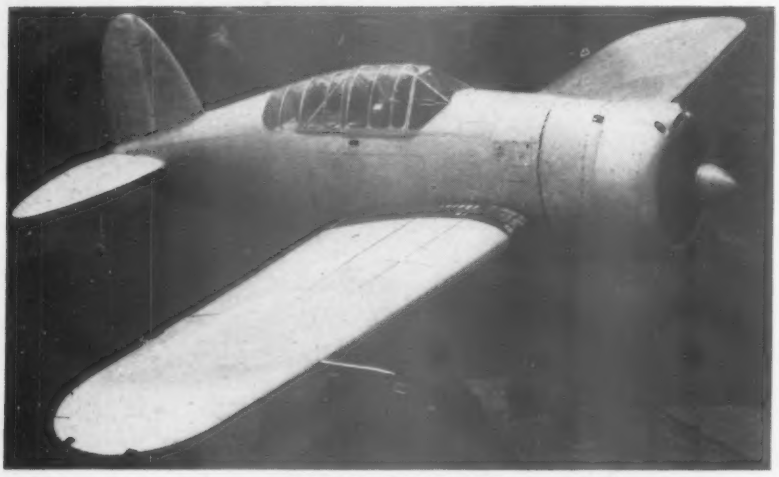
The issue appears to be—granted that our own air force will attain par value by June, 1941—could the aviation industry bear the brunt of a $1,000,000,000 order? How soon could such a monstrous demand be fulfilled? This requires total immersion for a few chilly seconds in production statistics. Authoritative sources rate the peak output of heavy planes in the United States (aside from 20,000 potential sport ships) from 12,000 to 15,000 per year. It is reasonable to believe that these totals aren't too haywire. Under ideal circumstances they may even be too low. The figure may be vastly higher by 1941. For in southern California alone, seat of slightly more than half the domestic manufacturing, major firms could grind out 8,000 ships annually. This isn't a guess; it's attested by the builders themelves—predicated, naturally, on extra work-shifts, the seven-day week and concentration of a few basic models.

At the moment the industry is working at approximately one-half its potential top speed (without more plant expansion). For this there are ample causes. Things burgeon out just so fast and no faster. In aeronautical exports alone, the American aviation industry marched from a paltry $9,000,000 in 1933 to a whacking $117,-

**Below is one of a large number of North American trainers ordered by the French. Many already are in use behind western front.**

**Quietly ordered and delivered to Canada are a number of Douglas "Digby" bombers, externally identical to the U. S. Army's B-18A.**





**Britain, Belgium (also see page 57), Finland and the U. S. Navy have bought Brewster fighter. Under-fire performance data on U. S. warplanes are supplied by the Allies.**

000,000 last year, when 91 countries bought our planes. That's moving. So are the backlogs of United States companies which today (unless the precious infant has already been born out of all those Washington-and-Manhattan conferences) surpass $625,000,000. They show a better than 200 per cent increase in the past year.

Once the orders themselves have been placed things will happen. You'll see such firms as Douglas (which offers the DB-7 attack-bomber already bought by France in job lots) "farm out" sections of the business to other competent west coast plants. Factories equipped to produce heavy, multi-engined ships will get their cut of the melon; they'll work from Douglas plans and jigs.

The same will pertain to Lockheed's anticipated order for 1,000-or-more twin-engined P-38 interceptor-pursuits. While this will not be the original "Three Company" purchase plan considered by the Allies' buying mission—Douglas, Martin and Curtiss were to get the whole turkey and dole out the gravy—it will at least assume some aspects of it. The foreign purchasers believe this to be the fastest, most efficient means of getting what they want. So, apparently, does the industry itself.

But if the aircraft plants themselves could mushroom, engine manufacturing shops find the expansion process more painful. In the former, for example, the Vultee Aircraft Corporation at Downey, Cal., today reckons on 310,000 square feet of floor space. One year ago it had only 145,000 square feet. Such growth costs less than $10 a square foot.

Making engines is a trickier business than fabricating wings and fuselages. Factory room—complete with equipment—can cost several times that used by the plane makers. Yet the motor makers *have* grown. Figures publicized in Washington by a White House source show that their floor-space has increased from some 1,800,000 square feet to better than 3,000,000 square feet in the face of the forthcoming boom. Their output, too, has upped. Engines rated at 1,000 h.p. or better can be whisked off assembly lines now at some 18,000 a year. It is fondly expected that expansion will permit another 10,000 a year by next December. This still will leave engine production lagging behind peak aircraft output. Unfortunately, you can't fly a ship without a motor.

So, although they're pretty tired of being reminded about it, the powerplant makers form the industry's chief bottleneck. Secretary of Treasury Morgenthau has said this. So have the $40-a-week mechanics in the assembly lines in Los Angeles, where planes stand idle, ready for engines.

That's a hard nut for somebody's teeth. At best, it will mean that foreign purchasers may wait months for initial deliveries, years for final planes on large orders. Probably contracts initialled today will designate completion in 1942.

Skipping all this for a moment, what of the other obstacle in the path of the adolescence of our Billion-Dollar Baby: the hue-and-cry that we're selling our aerial supremacy abroad? The "moral-political" objection? On this score we quote Maj. Joseph L. Stromme, the Air Corps' southern California watchdog and procurement boss in that area. He can speak with authority. Like many an Army man—including Maj.-Gen. H. H. Arnold, chief of the Air Corps—he sees the brisk European trade as a boon—not a boomerang.

"The Allies have come to our aid," Major Stromme declares flatly, "and have given our aircraft industry sizeable orders which probably will be increased. As a result the manufacturers are entering into *mass production* with the necessary tools, jigs and fixtures. Some of the builders in this (southern California) district will soon be turning out as many as 12 planes a day."

His next statement is pregnant with meaning:

"If orders continue to come as anticipated, the aircraft industry will be on war production basis within the next six months."

Major Stromme speaks from first hand knowledge. His feet don't park beneath a desk in Washington, D. C. Almost daily, he visits the Douglas Aircraft Co. (backlog at last accounts: $100,000,000), Lockheed Aircraft Corp. ($70,000,000), North American Aviation, Inc. ($50,000,000), Consolidated Aircraft Corp. ($49,000,000) and Vultee ($15,000,000).

Next Major Stromme terms the aircraft currently steaming in freighter-holds to France and England as "second-rate as far as we are concerned"—although "better than most made in Germany". Of these, some 1,600 have already been delivered. He declares that five pursuit ships in th United States surpass the Curtiss P-36 which has done yeoman service on the Western Front (no need to list them: any school kid who reads an aviation magazine knows them).

From such a source, this argument seems to freeze at least one Congressional complaint. After all, the Army has been entrusted with national defense. If our foreign sales *were* jeopardizing that, no spokesman of Major Stromme's stature would dare open his mouth.

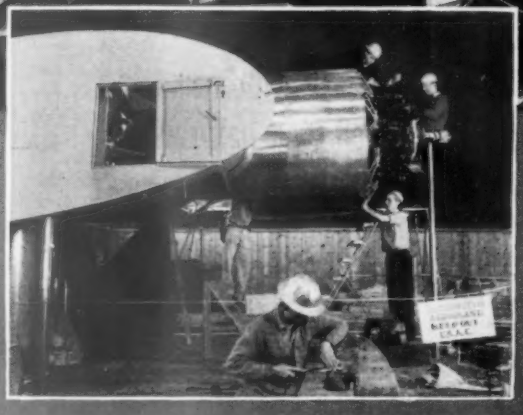
Less than a fortnight after he addressed representatives of the aircraft industry in southern California, however, the "clincher" was administered to any lingering doubts Congress might have felt about the propriety of peddling our newest warplanes abroad. This body-blow made it plain that such export models wouldn't be "second-rate". They'd come close to A-1. The speaker was Secretary of War Woodring. What he told the House Military Affairs Committee made news. You read most of it a few weeks ago. But not all the details trickled over the press wires. For instance, none of the wholly- or

(*Continued on page* 88)

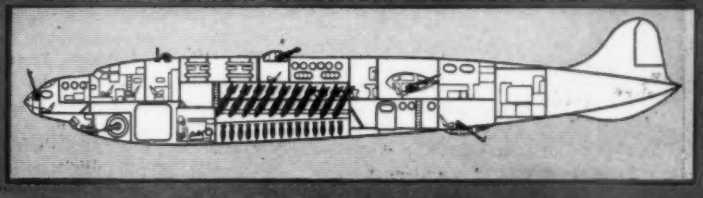
**On Douglas production line below are twin-engined DB-7's for France and England (center and left) and single-engined 8A-4's for the Netherlands, Peru and Iraq (right).**

# WAR GIANT

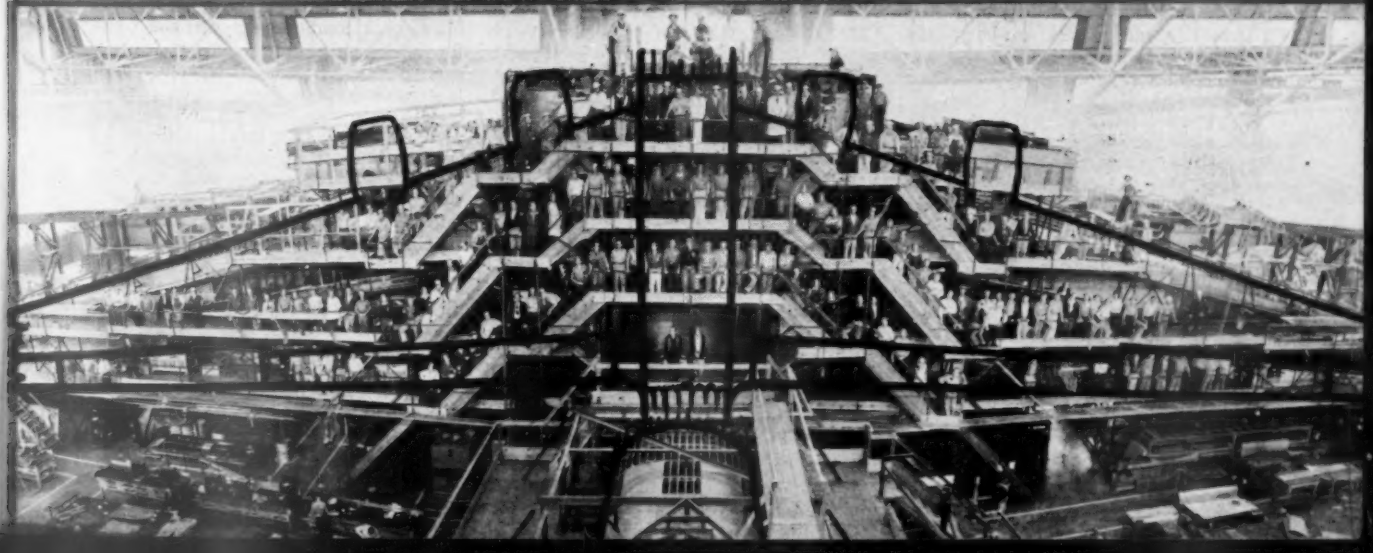
ANY bomber the size of the Army's new Douglas B-19 shown on this page probably never will be widely used for military purposes. More logical is the belief that the B-19 is one way of having the Government foot the development bill for the giant airliner of the near future. Powered with four 1,500 h.p. engines, it could carry 325 persons 200 m.p.h.



Tail of the B-19 (above) is nearly five stories high. Left is one of four engines in its mount; workmen wear helmets for protection against falling parts. Directly below is drawing from German magazine, supposedly of the new bomber. Note machine gun and cannon emplacements. Tail design is of DC-4.



Outline below shows comparative size of B-19 wing. Span will be more than 210 feet. Ship will have sleeping quarters for 10 men, retractable tricycle landing gear, 16-foot propellers, weighs 42 tons empty, has 6,000 miles range.



# There's Grief in Them Thar Hills

by TEX RANKIN

This Mexican air force Ryan trainer is staying far away from the treacherous slopes of Mt. Popocatepti.

Tex Rankin

**Ask the pilot who's had experience with mountain air currents. He probably can tell some hair-raising experiences. Flyers, heed the author's advice.**

WITH the high performance airplanes and engines we have today, pilots are giving less and less attention to the effect of wind currents upon the flying characteristics of their ships. Yet even in the face of these vast improvements, the pilots of today can avoid much trouble and obtain even better performance from their ships by making a serious study of mechanical convection, or should we say "wind vagaries."

The study of wind currents is strongly recommended for the amateur flyer, especially one who flies a lightplane. Such information may avoid loss of equipment and even prevent serious injury to the pilot many times during his, or her, flying career.

Everyone who has flown over mountainous terrain has experienced the effect of mechanical convection upon the airplane. We refer to these wind currents as "bumps" or "up-drafts" and "down-drafts" and usually they are not very violent. But their violence increases as the velocity of the wind increases and such down-drafts as are encountered on the leeward side of a mountain can become dangerous to an aircraft.

Violent down-drafts caused by wind are rarely if ever experienced over flat terrain. I have flown in winds across Iowa, Illinois, Indiana, parts of North and South Dakota, Missouri, Kansas and Texas and Michigan that I would not even think of flying in if I were in mountainous country. Winds that would cause little if any difficulty in some of the states mentioned above might cause a pilot to get into serious trouble in some of the western states.

It is important to remember that a wind blowing straight downward (down-draft) at 20 m.p.h. is traveling toward the earth at 1,760 feet per minute. At 30 m.p.h. it is going downward at the rate of 2,640 feet per minute and at 40 m.p.h. at 3,520 feet per minute. How many commercial ships can boast of such a rate of climb? None.

Many people think that the wind flows parallel to the surface of the earth. This supposition is not altogether true because hills, mountains, temperature or atmospheric pressure may cause air currents to flow at any angle or in any direction. As an example, a pilot must think of the wind flowing over the leeward side of a mountain exactly as a waterfall. He must think of his airplane in the same light as a salmon trying to swim up the falls.

If he is flying a ship with a maximum climb of 1,000 feet per minute and he flies into a down-draft with a downward velocity of 1,760 feet per minute it is certain that the ship is going to settle at 760 feet per minute. If the down-draft has a velocity of 3,520 feet per minute, as in a 40 m.p.h. wind, the ship would have a net loss of altitude of 2,520 feet per minute.

One thing to bear in mind is that under such conditions the airplane, even though losing altitude is climbing at its *maximum* and is flying dangerously close to its stalling speed. Also, it is very important to remember that, not only will any attempt to stop the loss of altitude by pulling the nose up higher probably result in a stall with subsequent spin, but that there will be trouble if the pilot fails to put the nose down and obtain a safe air speed before making a turn. This would be the same as making a steep climbing turn under ordinary conditions, probably resulting in a spin.

The most dangerous down-draft condition occurs when an aircraft takes off into a strong wind headed straight toward a high hill or mountain. It is under such a condition that fatal acci-

Canadian flyers know mountain flying well. Note shadow of R.C.A.F. plane on cloud.

dents occur as the result of attempts by pilots inexperienced in down-drafts to make a quick turn at a maximum rate of climb with the air speed too close to the danger mark at a low altitude.

One must bear in mind that whenever a current of air is forced downward an up-draft or up-current exists nearby. This up-draft represents the volume of air which is being displaced by the down-draft. The up-drafts always occur on the windward sides of all hills and mountains (except thermal up-drafts or "heat bumps" caused by summer heat) and these up-drafts are very beneficial to pilots, for they may add as much as 3,000 feet per minute to the climb of an aircraft. Therefore, when one experiences a bad down-draft it is usually proper to make a cautious turn and fly down-wind toward the windward side of a hill or mountain to obtain the assistance of the up-drafts.

Fifteen years ago this spring I stood on the old Marina air field beside San Francisco Bay, part of the site of the 1915 World's Fair. I was visiting my old friend, Sam Purcell, who has been flying airplanes over the bay region since the days of Lincoln Beachey. A Curtiss JN4-D with an OX-5 engine was being prepared for flight. Someone had purchased the ship and had hired a pilot who had flown during the first World War with Russia (but had not flown since) to take it up. A strong west wind was blowing in through the Golden Gate. It also poured down over the mountain south of the Golden Gate, at the foot of which lies the Presidio and Crissy field. The pilot used poor airmanship from the beginning. He declined to be checked out; he filled the gas tank to capacity instead of taking on a light load; he carried a heavy passenger with him on the initial test hop instead of taking off lightly loaded and, as soon as the ship was off the ground, he pulled the nose up into maximum climb. Instead of turning over the bay as soon as possible he continued straight westward, heading for the high hills back of the Presidio where strong down-drafts existed and when, at an altitude of about 500 feet, he struck the first bad down-draft, he started a quick turn without putting the nose down to gain a safe air speed. Of course, the ship whipped into a spin instantly. At that moment he did the only correct thing so far. He put the nose down and just pulled out of the spin in time to miss the runway on Crissy field. He headed out over the bay, turned slightly to the right and flew along the shoreline at an altitude of about 150 feet, still holding the nose up to the stalling point. Sam and I ran to the edge of the Marina and motioned to him to put the nose down. He looked at the Marina, decided that was the one spot above all others he wanted to be, so he started to turn toward us. He stalled and spun into the bay. Sam and

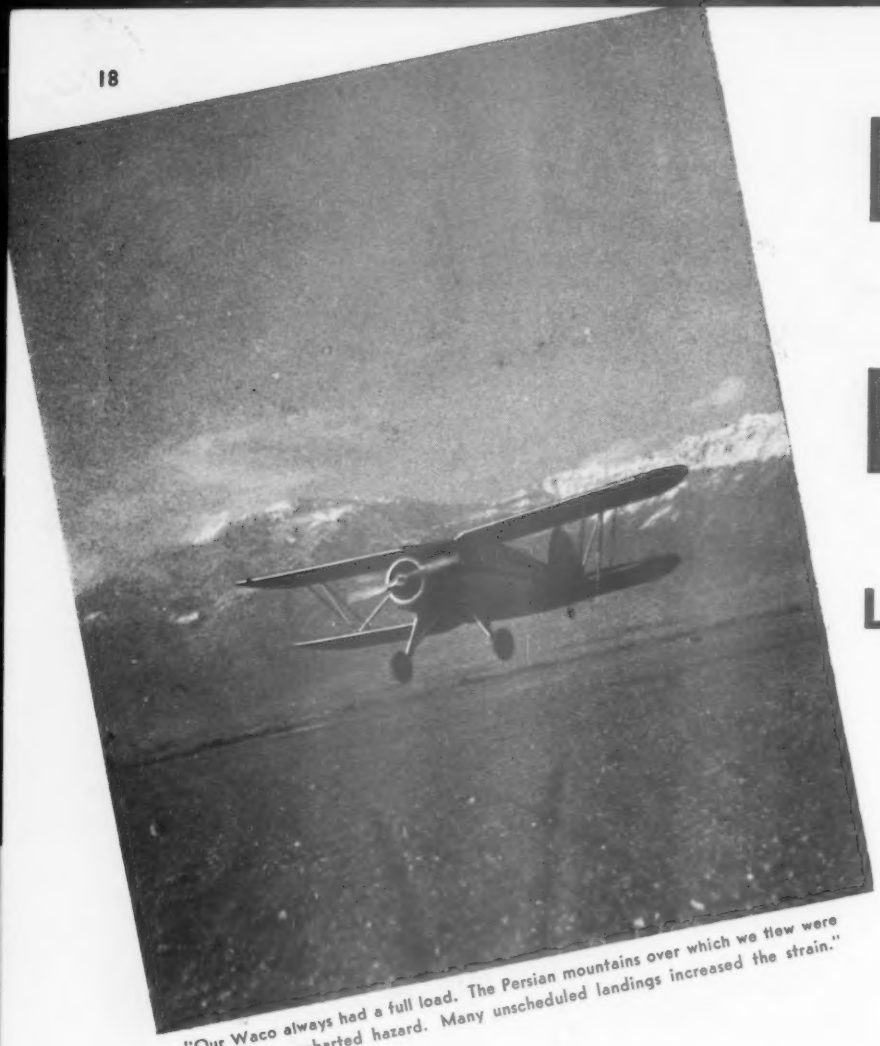
(*Continued on page 60*)

This is a Ryan cabin ship similar to that in which the author encountered the violent down-draft described in this article. The big monoplane withstood a 10,000-foot drop.

"The most dangerous down-draft condition occurs when an aircraft flies into a strong wind, headed toward a high mountain." Note treacherous slopes that deflect wind.

# FLYING and NERVES

## By LEWIN B. BARRINGER



"Our Waco always had a full load. The Persian mountains over which we flew were a constant, uncharted hazard. Many unscheduled landings increased the strain."

**Does a pilot ever get jittery? If so, what are his reactions, his thoughts, his "safety valves"? One of the country's leading flyers analyzes his feelings.**

NO doubt a great deal has been written about the effect to the human nervous system of flying airplanes. However, most of it remains buried in the files of military flight surgeons and civilian medical examiners. Even if this information could be made available and condensed, it probably would make pretty dry and unintelligible reading for the average layman as well as airman. My having the temerity to write on such a subject from my point of view is due not to any medical knowledge, but simply to the fact that it may be of interest to the average man whether he flies or not.

First of all let me emphasize the final "s" on the title of this article. I am writing of reactions to the nervous system, not of the usual expression of "nerve". It does not take any appreciable degree of "nerve" to fly so we will confine ourselves to the plural of the word.

All of us have nervous systems, a basic part of our individual physical makeup. As no two persons are identical, so no two nervous systems are exactly alike. For purposes of rough comparison I will group individuals into three divisions: the very nervous on one hand, those lucky and phlegmatic souls who never seem to get upset about anything on the other and, in between, those with ordinary reactions and reflexes. The first class will probably be largely washed out by the medical examiners so we need not concern ourselves with them. I know a number of excellent pilots in the second class and envy these men who remain cool, calm and capable in any crisis that may arise in the air. There are a few, however, that occasionally worry me.

One I remember well. He was a pilot who had flown during the first World War and only occasionally since. He would go out in almost any weather night or day despite lack of instrument training. It wasn't his apparent "lack of nerves" that worried me about him, it was his lack of imagination. That's a bad combination. After one escapade of his when he had flown home quite a distance through a blinding snowstorm by flying over a railroad track so low that he had to pull up for the signal towers, I told a mutual friend how I felt about his flying. I said that I thought that a good scare once in awhile was a healthy thing to keep you on your toes for safe flying. At this he opened up and told me of his reactions in tight places. He is a pilot with a great deal of experience obtained through a total of over 8,000 hours of military and miscellaneous commercial flying.

One experience he related to me I shall always remember. He was flying his Bellanca at an altitude of only 500 feet making aerial photographs of the built up section of a good-sized town when the J-5 engine swallowed a valve and froze up. Somehow he got it down in one piece in a sizeable vacant lot. It had taken an extremely steep slip to do it and he admitted that his knees were shaking so that he could hardly hold the rudder over.

I imagine that most of us with more than a few years of flying can recall instances where our nervous reactions were on this same order. I remember once when I was flying a *Challenger*-powered Curtiss *Robin* towing a heavy sailplane off Barrett Airport in the Pocono Mountains in Pennsylvania. Although taking off downhill I was still on the ground when only 50 feet from a stone wall—too late to do anything but pray—when the pilot of the sailplane saw my predicament and dived his ship down from

Soaring, the author believes, is one of the finest forms of relaxation a power-plane pilot can have. He is shown above with a two-place sailplane just before a flight. Mr. Barringer holds soaring records.

his height of 15 feet thereby slackening the rope so that I got off in time just to squeeze over the wall between a clump of trees on my left and the hangar on the right. It took quite a few minutes and several thousand feet of altitude before my nerves were calmed down again to normal.

So much for the reactions to brief crises. How about the cumulative effect of a considerable amount of dangerous flying? I can tell you about that from personal experience and it isn't pleasant. On the Iranian Expedition (for which I was pilot) a few years ago we took a side expedition into the wild, mountainous and little-known province of Luristan in the southwestern part of the country. To take every advantage of good weather late in the year, we flew from four to six hours every day for 17 consecutive days without a let-up. At the time this didn't seem so bad but I always had in our Waco a full load of equipment and passengers including the director of the expedition, his wife and the Persian officer we were required to carry. In addition to flying most of the time over mountainous terrain so high and rugged that an engine failure would have spelled disaster, we made numerous impromptu landings to examine mounds of prehistoric occupation in valleys as high as 8,000 feet. A blown tire or broken propeller would have marooned us weeks from help.

It wasn't until after all this, when the ship had been put up for overhaul in the winter, that I realized what the nervous strain had been. I guess that it was the fact of always carrying those passengers whose lives depended on me for so many hours over impossible country that finally got under my skin. Anyway, I was pretty jumpy for some time and slept fitfully, waking many times out of awful nightmares. What bothered me most was the fact that at our Persepolis base I became afraid to walk near the edge of the stone terrace on which stand the ruins of the great palaces built by the Achaemenian dynasty 2,500 years ago. This edge drops off vertically only 50 feet and I had never before been bothered standing on the edge of far greater precipices, having once stood on the end of the overhanging rock in the Yosemite where a slip would have landed me 3,000 feet below. During the next few weeks while I was busy with ground work I used to make myself climb the ruins and sit near the terrace edge until my nerves settled back to normal.

Some of those hard-boiled, veteran Canadian bush flyers may read this and laugh at what to them seems a sign of weakness. I'll readily admit that my nerves may not be as tough as theirs, but I doubt if the set I have are any worse than the average. I know of one senior captain of a great airline who, a few years back after a spell of winter flying, had to give up for a few months and rest on a ranch in the sunny southwest to keep from having a nervous breakdown. In a few short weeks he had had to contend with every condition that had caused a major airline crash that disastrous winter. It is not hard to understand the CAA ruling prohibiting airline pilots from flying more than 85 hours a month.

Although it would be possible to go on indefinitely giving examples of the effects of cumulative nerve strain on pilots doing difficult and dangerous flying while carrying the heavy responsibility of human lives entrusted to their keeping, much of this is past with the vastly superior equipment, supervision, navigational facilities and meteorological knowledge that we have to-day. Also there is another side to the picture, a bright side of plus to offset the minus that has gone before. Do I mean to say that flying can actually be beneficial to human nerves? I certainly do! My favorite story on this side of the ledger concerns a good friend of mine who is a distinguished surgeon. I took him up one afternoon in an open Waco and he liked it so much that he used

(*Continued on page* 92)

# The Laws of AERIAL WARFARE

Japanese bombers, though technically limited to military objectives, did this to Shanghai, China.

By

## EDWARD LAWSON

**It may sound funny today, but there are rules on the books that air warriors should follow.**

AIR war essentially is a lawless business. Still, it has its rules and regulations, its accepted practices and precedents. Traditionally the one form of combat in which no quarter could be given or accepted, it has "grown up" since the last world war and at present there is a large and increasing body of precepts by means of which its slaughter may be curbed and made at least a bit humane—a well-developed code to guarantee its perpetrators something like a fair chance and an equal fight.

War comes swiftly, without warning, these days. Frequently the shrill whine of an air-raid siren is the first sign that it exists. Once the first shot has been fired, the first bomb dropped, every action of a warring nation's aircraft instantly becomes an incident of international proportions to be weighed against the tenets of accepted air law. As long as this slim legal bar to carnage is faithfully observed, there is order and some semblance of sportsmanship. If it manages to hold out long enough, other factors may force settlement. But once deliberately violated, terrible reprisals may begin immediately and the resulting holocaust could in time wipe out our civilization.

To date the newest war in Europe has been fought, in general, according to

These Chinese ships are legitimate targets. Oil spot (lower left) marks sunken vessel.

This Douglas airliner of China National Airways was shot down by a Japanese fighter. Insignia means "mail".

the rules—at least so far as aviation is concerned. Neither Germany nor France nor England has purposely bombarded centers of civilian population—possibly excepting the German invasion of Poland. Hospitals, churches and museums have been spared except in isolated cases. Captured aerial photographers have not been shot as spies, but treated properly as prisoners of war. No poison gas has showered from the sky, no bacilli-infected cake or candy has been dropped into the streets. Explosive, incendiary and expanding bullets have yet to make a large-scale appearance and no cross-marked "flying ambulances" have been ruthlessly shot down.

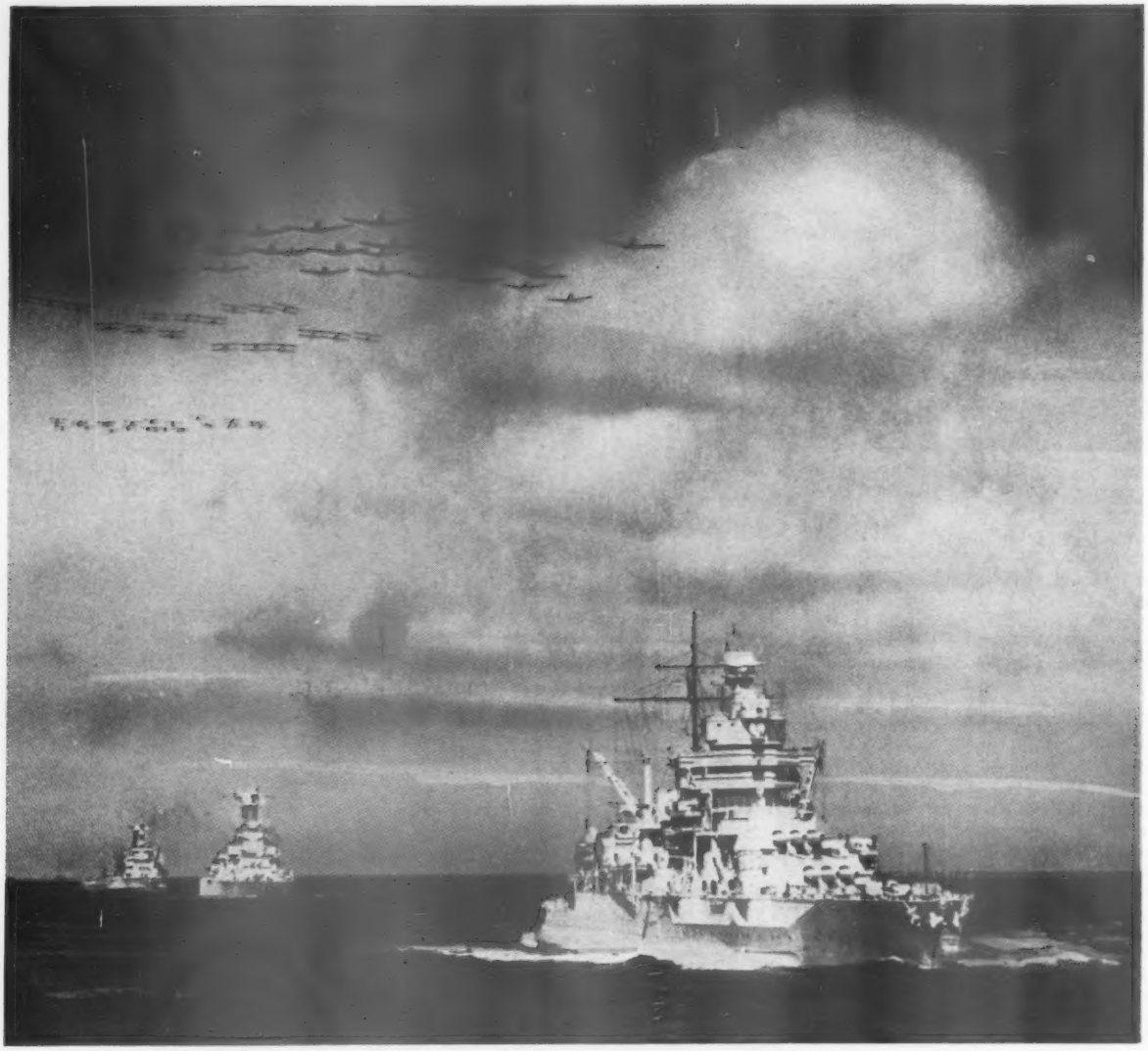
However, the spring thaws are at hand and both Germany and the Allies already are giving notice of intensified aerial activity. What this may mean at any moment is a shelving of all of the "conventions" of international air law in favor of a *blitzkrieg* policy designed to bring quick victory at any cost. Undoubtedly this policy will be adopted only after many "provocations" of the enemy, some real and some imagined. Undoubtedly, too, its terrors will soon so shock the whole world that the demand for some actual and effective check upon its use in international warfare will arise from every nation claiming to be civilized.

No matter what occurs—and certainly we have a right to keep on hoping for the best, which is to say at least for the continued mutual observance of the amenities of legal conflict—we in America are going to be hearing a great deal of the laws of air war in the next few months. What, exactly, are they? Where are they written down? Who passed them and when? To whom is their enforcement delegated? What happens if there is a violation? How are they kept up to date, to meet ever-changing situations? Why is it that, in spite of their importance, the powers of the world invoke them usually only when they want a good excuse to break them—and tend to forget them absolutely as soon as the going starts to get tough?

(*Continued on page* 74)

Most violations of international law by aircraft deal with attacks on civilians. At right is a Russian bomber just as it bombed a Finn city.

Incendiary bombs are outlawed in the same manner as explosive bullets. Below is a Finnish town shortly after Russian bombers showered it with a rain of fire-bombs.



Several squadrons of torpedo bombers and fighters pass in review over battleships of the Pacific fleet.

# EAGLES WITH CLIPPED WINGS

## by KURT RAND

*Veteran Naval airmen are being shelved by a selection board of admirals. Angry Congressmen are threatening investigation.*

Barnaby Rittenhouse Lyon Connell Crinkley Brow Stanley

PERHAPS, before this reaches print, Congress will have seen fit to retrieve from the brink of forced retirement a group of Navy "eagles" whose early flutterings, in the days of primitive equipment, did much to keep wings in the Fleet. Their fate, at the present writing, was uncertain indeed—uncertain in a profession they had expected would yield them careers as long as they were able to fulfill required duties.

These are the World War flyers who will, unless Congress corrects the situation, fall victims to inconsistencies they could not possibly have foreseen when, in their early 20's, they chose to accept the Government's promise of employment until desirable retirement age. That was in 1919, long before the Naval selection system of promotions (and involuntary retirement if the selection board turns thumbs down) was conceived.

Today these men hold rank as commanders, having been adjudged "fitted" for service in that status. Yet, paradoxically, they are not recommended for retention in active duty. Some have had spectacular records. Others have been steady, consistent, dependable pluggers. All have, by virtue of their pioneering, contributed immeasurably to the profession which has sought to cast them out.

Because the list is comparatively small does not lead to the conclusion that a molehill is being blown into a mountain. In national emergencies—such as that which a world at war has brought America—any situation whereby capable military aviators, still in their prime, are likely to be sacrificed, demands attention.

Here, then, are the eagles whose wings gold-epauletted superiors had threatened to pinion:

David Rittenhouse, winner of the Schneider Cup after England had held this international emblem of racing supremacy for several years.

Harold J. Brow, member of the first aviation detail aboard the first aircraft carrier *U.S.S. Langley* and who commissioned two of the Navy's most recently developed aviation bases, Reeves Field on Terminal Island, Cal., and the Alameda Air Station.

Rossmore D. Lyon, one of the earliest flyers attached to the giant carrier *U.S.S. Saratoga*, a squadron commander consistently since 1928 and senior squadron officer of the greatest mass flight ever undertaken by Navy patrol bombers—48 Consolidated PBY's from San Diego to Coco Solo and on into the Caribbean and Atlantic for the 1939 Fleet Problem.

Andrew Crinkley, with Brow and Lyon a member of the *Langley's* early daredevils; noted for his skillful piloting of the Navy's largest bomber in active commission, the Consolidated four-motored PB2Y, which has flown twice non-stop across the continent and was designated the first flag plane in the service by Rear Adm. A. B. Cook in an inspection tour of Alaskan bases last year.

Cyril T. Simard, in charge of the navigation school at Pensacola after the World War and prominent in the development of the catapult when first placed aboard warships.

Henry T. Stanley, a member of the bombing group which operated with great merit from North Sea bases in combat patrol during the late lamented conflict in which this country became embroiled; a squadron commander in Coco Solo, Honolulu and San Diego in recent years.

Byron J. Connell, pilot with Comm. John Rodgers in the first daring attempt to span the Pacific—from San Francisco to Honolulu—a flight that ended disastrously but produced an epilogue of courage and the indomitable will to live. For 10 days the plane drifted while the world gave them up as hopelessly lost.

Ralph S. Barnaby, notable for his enthusiastic experiments in gliders. Like Connell, he has specialized in engineering duty much of his career.

In 1938 a selection board of admirals convened in customary secrecy and decided,. with quite a sweeping gesture, that the condition of the country and the Navy at that time regretfully did not warrant retention of these flyers—though, mind you, *they were found fitted for promotion to the next higher rank and its attendant duties.* By normal procedure, these men must step as gracefully as possible out of the ranks on June 30, 1940.

But conditions suddenly changed. Nations since have crossed swords and the American Navy's air force has been mushrooming to majestic proportions. Many are the new planes and many are the experienced heads required for command posts. Rear Adm. John H. Towers, chief of the Bureau of Aeronautics, reported that, based on the training schedule

(*Continued on page* 84)

**Some of the veteran officers being retired were largely responsible for the Navy's many successful mass flights of PBY patrol bombers (below) to Hawaii and Panama.**

This is some of the cargo commonly hauled by Sacramento Air Depot ships.

# Workhorse Squadron

By

**FRANK CUNNINGHAM**

Giant hangars like this house hard-working Army transport squadron aircraft.

# Army transport planes haul anything from pencils to engines to any corner of the country at a moment's notice.

Many cargo ships now used by the Army are Douglas DC-3's with DC-2 fuselages. Loads chiefly are freight.

Lieutenant Sailor

SILVER aerial fortresses against the cloud - spotted azure sky, the Army bombers thunder their approach with the roar of throbbing motors. Streaks of color slicing the heavens are the pursuit ships rocketing through the atmosphere. Most everybody these air-minded days knows about the Army Air Corps, the work of the bombers, the gyrations of the spectacular fighters. But even, as in the story of the old kingdom that was lost "all for the want of a horseshoe nail," the efficiency of the Air Corps depends to a large extent on that "horseshoe nail" and the warbirds aren't letting any stone remain unturned in keeping it from being misplaced. The duty of making certain that the "nail" is in the right place at the right time belongs to one branch of the Air Corps that has received little publicity and is virtually unknown to the general public. This branch is made up of the transport squadrons.

Typical of these is the 4th Transport Squadron at the Army Air Depot outside Sacramento, Cal. Commanding officer is First Lieutenant Lloyd L. Sailor, young in years, but a veteran flyer of multi-motored ships with 4,100 hours to his credit. Ask Lieutenant Sailor why transport squadrons and their work are unknown outside Army circles and he'll tell you: "True, our work is vital to the efficiency of the Air Corps, but it isn't epoch-making in the news sense of the world. We've got serious work to do and we do it in a serious manner. It's the old story of 'the show must go on,' except with us the angle is 'the supplies must go through, and it is up to us to get them to their proper destination as expertly as possible. All our training is conducted with this paramount objective: to be able to fly in any kind of weather—day or night—and reach our destination. Incidentally, we don't have many accidents."

Many? Lieutenant Sailor was being overly modest about his own squadron. The 4th Transport Squadron hasn't had in its history a single fatality or a serious crackup. It has had only two minor accidents and no injuries. Those pilots get their assignments completed, too. Bad weather to them is something that California never talks about—and neither do they!

Exactly what and where are these transport squadrons? Until recently there were four of them in the United States. Now there are seven. These are located at Patterson Field, Dayton, O. (the 1st and 5th are there); Middletown, Pa. (home base of the 2nd and 6th); San Antonio, Tex. (the 3rd squadron); and Sacramento, base for the 4th and 7th squadrons.

But we'll limit the discussion to the 4th squadron and its companion, the 7th. The latter, commanded by Second Lieutenant Thomas S. Algert, still is somewhat a part of the 4th, as complete separation will not come until new barracks are constructed for the housing of the 7th. All airplanes are now assigned to the 4th.

Duty of the transport squadrons at Sacramento is the delivery of airplane parts to various Army units within the depot's control area, as well as intra-depot supply work over the entire nation. In addition, the transport squadrons are used to train pilots in the handling of multi-motored ships and teach them the layout of the country so well that, at a moment's notice, essential plane parts can be dispatched to any point in the nation with the assurance that the pilots will be able to get through safely. In an emergency the vital "nails" might be the difference between success and failure and if not a kingdom, at least a republic, might be lost or seriously threatened.

When speed is essential to the Air Corps for new or replacement parts, the transport squadrons get the call. The Sacramento outfits are under the authority of the 10th Transport Group, commanded by Maj. Frank S. Dorum at Wright Field, Dayton, O. This in turn is a part of the Field Service section of the Air Corps. But the commanders also are under orders from individual base commanders; in the case of the Sacramento Air Depot, Col. Frank M. Kennedy.

In discussing the transport squadron's work, Lieutenant Sailor said, "When a ship departs from Sacramento, all the points where freight is to be handled are advised of the departure so that the necessary personnel for loading and unloading will be available to avoid unnecessary delays. We also call in by radio when 25 miles out of all stops to be sure a loading crew is available to accept supplies from

**Through this special freight door goes up to 5,000 lbs. in a single load. The C-39 has two 950 h.p. engines, cruising speed of 175 m.p.h. and a normal range of 650 miles.**

and deliver them to the ship. When we take off from Sacramento for the east, Middletown or Dayton knows it within an hour by Army radio.

"Loading is by Civil Service employees at the depots. But at the regular Army posts the freight is handled by Army personnel. The ships are loaded either at night, the day before or the night before the ship's take-off. When fast work is necessary complete loads of 3,400 pounds have been unloaded and another loaded and the ship made ready to depart within the space of an hour.

"We have plenty of work to do. For example, most Army posts at holidays and between Christmas and New Year's keep only guards and the personnel necessary for fire protection on duty. But at Sacramento four freight shipments were carried by the 4th during that Yuletide period in 1939. Two trips were to San Antonio and two south. The pilots, though, are thoroughly accustomed to this and holidays mean little to them; they operate on a seven-day week if necessary."

The transport squadrons do other duties besides carrying freight. This is a typical case: the Sacramento air depot was ordered to house and train 122 new recruits until such time as water transportation was available for their transfer to Hawaii. When the time came, instead of the usual procedure (transportation by railroad to a point near the ships) the transport squadrons merely put seats in the planes, flew 60 recruits to the landing field at the nearest point of debarkation. In all, only six flying hours were involved and this transfer was made between freight trips.

Because the majority of the intra-depot and cross-country flying is on regularly established airways, it is highly important that all pilots observe the CAA rules and regulations on such flights. The Army transport pilots adhere closely to these regulations. Yet in all this talk of orders, schedules and efficiency, the pilots of the transport squadrons are remarkably free to use their own judgment in flights. Actually there is no schedule. The one rule is that flights must start at 8 a. m. no matter from where the plane takes off. The pilot's route, the hours he flies, all are up to him—although he is expected to take the shortest route possible in line with safety and to refuel at Army posts if possible. Even if a pilot is supposed to fly eight hours a day this is an average and may be made up at the pilot's discretion.

"One reason for the trust put in a pilot's judgment," Lieutenant Sailor explained, "is that our men have been well seasoned by experience. In the 4th squadron, for example, we have one principal pilot with over 5,000 hours, two with over 4,000 and several with over 3,000. All are graduates of Kelly Field. With the advent of the Air Corps expansion plan, new pilots assigned to us will have to get their bulk of experience in transport ships with the squadrons.

"Our flyers work first as co-pilots on freight flights. The Air Corps regulations state a pilot has to put in 750 hours as a co-pilot and two years' experience before he can be eligible for a principal pilot. At present the two squadrons here have 11 first pilots and the rest are co-pilots." Normal crew for a transport is a pilot, co-pilot and mechanic. Passengers may be carried in addition to freight, but free-riders must be Army men, no civilians are carried except Civil Service employees on orders from higher authority. If necessary, 14 passengers can be carried; seats can be installed in a few minutes.

Used mostly for freight work at Sacramento are Douglas C-39's. These ships are a combination of the DC-2 and DC-3. They have the tail and wing section of the DC-3 and the fuselage of the DC-2. The engines are 950 h.p. Wright *Cyclones*. Cruising speed is about 175 m.p.h. In addition to the Douglases, the squadrons at Sacramento have one Martin B-10 (used periodically for the drop-testing of parachutes), two Douglas BT-21 instrument ships for blind flying training; one North American BC-1 for instrument flying and another for the use of the post's technical inspector.

Pilots at the Sacramento depot are kept active. Normal load in the C-39's is about 3,400 pounds, which allows a gasoline load that makes stops for fuel necessary every 600-650 miles. As the freight load is increased, the gas has to be cut down. Maximum load for a C-39 is 5,000 pounds; in this case only 100 gallons of gasoline can be carried. Cabin space in the ship, available for freight, runs some 900 cubic feet.

With the exception of objects beyond the size limit, only restrictions on a ship's load are on chemicals. Explosive chemicals or those which could explode or cause fires are banned from aerial transportation. Whenever possible a transport squadron ship takes off with a normal full load and always tries to get a full load on its return flight. This is especially true with coast to coast flights.

The transport squadrons haul almost anything that can be put inside a plane: wheels, spark plugs, small surfaces, instruments, inkwells or toothpicks. From Sacramento, the transports travel in all directions. There is a constant flow of supplies from the various parts of the country at which manufacturers are located. About five trips a week are made to the east. Two or three usually are to Middletown and several may be to New York. About two trips a week are made to the north, usually to the Boeing plant at Seattle and the Air Corps unit at Fort Lewis, Wash. Incidentally, the east-west runs usually are made by way of Salt Lake City, Cheyenne, Omaha and then to headquarters at Dayton.

The Sacramento flyers go south about three times a week. Stopping places include the Douglas plant at Santa Monica and El Segundo, North American at Inglewood, March Field at Riverside, the Santa Maria, Glendale and San Diego (Ryan School) Air Corps training units and the National Guard group at Griffith Park, Los Angeles. In addition, contact is made with the Air Corps detachments at San Diego and Long Beach.

The Sacramento squadrons service Hamilton Field, the bombing base at San Rafael; the pursuit group and observation squadron at Sunnyvale, and the Air Corps detachment at Oakland. There is a rumor of a new Air Corps supply base for Alaska and, if this base goes through, the flyers' territory will reach from the Mexican border to Alaska.

This description of the work of the 4th and 7th Squadrons has been given at length so that the national setup of the transport squadrons may be realized. For, as the Sacramento squadrons cover the west, so do other service squadrons cover the country. It was the need for faster delivery of spare parts that led to the formation of the 4th Transport Squadron. It commenced as a small detachment at the Rockwell Air Depot, San Diego, about 1931. The squadron was successful in transporting parts so rapidly that fewer Army planes were out of commission and those on repair lines were there a great deal shorter time than previously. The squadron grew and was transferred to Sacramento when the $7,000,000 depot was opened in January, 1939. The squadron then was under the command of Maj.

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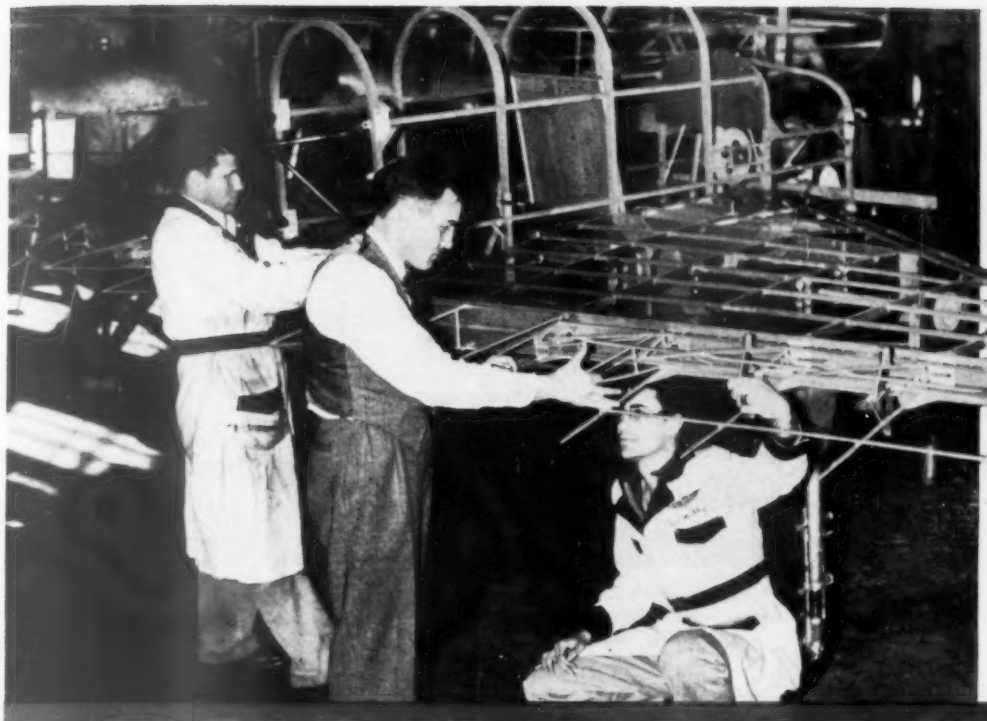


J. D. McKellar (center) works with students in the construction of his new airplane.

# PUSH-PULLER

## by Ernest A. Foster

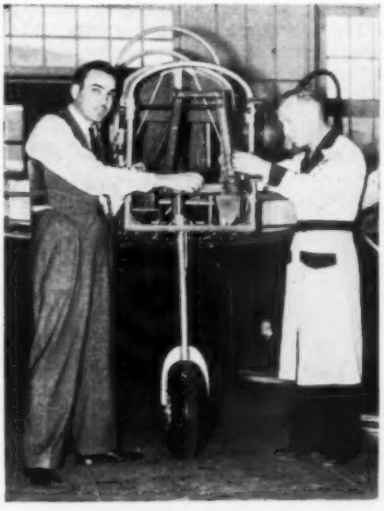
**A California aeronautical instructor has patented a novel twin-engined all-wing lightplane.**

CONSTRUCTED by students, a new type of twin-motored flying wing, readily adaptable to low-cost mass production, is nearing completion in the aeronautics department workshop at California State Polytechnic School in San Luis Obispo, Cal. Since the fuselage is built within the wing itself, the new craft has no tail. Movable surfaces on the trailing edge of the wings permit directional, lateral, and longitudinal control.

John D. McKellar, aerodynamics instructor, holds patents covering both the plane's design and the special steering devices that are unique in airplane construction. McKellar's co-instructors, M. C. Martinsen and Roy F. Metz, and nearly 150 students are aiding in building the flying wing. The plane was to be completed in May and given its first test flight at the San Luis Obispo county airport.

Despite its two motors, the plane will weigh less than three-quarters of a ton. It is of such simple design that McKellar is confident that it is ideal for economical production in large quantities. Wings and fuselage are of monococque construction similar to that of the fuselage of other modern airplanes. The shape of the wing is so designed that all ribs can be ripped with a band saw from two sheets of five-plywood.

"The entire framework could be constructed without difficulty at any small furniture or wood-working plant," McKellar said. "Metal or plastics could be used for the production, but plywood is cheaper. The tooling expense would be less with wood since fewer molds, forming blocks, dies and patterns would be necessary. It took two workmen about an hour to paste a paper pattern on the top of two plywood sheets of half-inch thickness and rip out all the wing ribs."



McKellar (left) supervises the placing of mounts for the ship's 75 h.p. engines.

Students working on the plane are installing two 75 h.p. Continental A-75 engines. One at the front of the fuselage will operate a tractor propeller and the other at the rear will act as a pusher. Cruising speed at 75 per cent power is expected to be 180 m.p.h. at sea level. The climb at that power is 1,300 feet in the first minute. Landing speed is calculated at 50 m.p.h.

McKellar's patented control system makes use of no vertical surfaces. Deflecting surfaces at the trailing edge of the wing upward or downward gives longitudinal control. Differential move-

ment of the surfaces, so that on one side of the plane the surface moves upward while that on the other side moves downward, produces lateral control.

"Directional control," McKellar explained, "is accomplished by separating the upper and lower surfaces of the control device toward which the turn is to be made in order to increase the aerodynamic drag on that side of the airplane and thus produce a yawing movement. The device is unique in that a single control unit is provided on each semi-span of the airplane wing, which will produce the required pitching, rolling and yawing movements independently or simultaneously.

"The device is also unique in that the sinking speed of the airplane may be increased by spreading both directional controls at the same time, thus increasing the drag of the airplane without producing a yawing movement. This action allows the sinking speed of the airplane to be varied when over- or under-shooting the field in the landing approach."

Control is by means of cables, but push-pull tubes or torque tubes could be used.

"Control through the stick or wheel is standard with two rudder pedals," McKellar continued. "Once inside the seat, the pilot will use the controls in exactly the same manner as he would in a conventional plane."

In addition to the economy and ease of construction—expected to cut 25 per cent from the cost of conventional bi-motored craft, the flying wing will have other advantages, McKellar believes.

1. It should be faster than the conventional two-motored airplane because frontal areas are smaller. It will have the frontal area of one engine but the power of two.
2. It has fewer parts.
3. The engines are attached directly to the fuselage, eliminating the structure necessary to install them in nacellas or streamlined bodies built in the wings.
4. The wing load is lower because of reduced structural weight.
5. Cost of the tail and extending fuselage is eliminated.
6. It is safe because of the two engines, either one of which is capable of maintaining the plane at a 10,000-foot altitude.

Two disadvantages uncovered will be adjusted in later models. The difficulty

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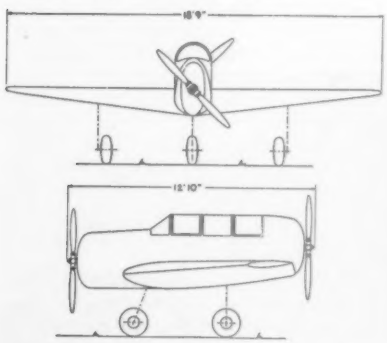



Two-view drawing of McKellar's design.

## Flexible Fighter

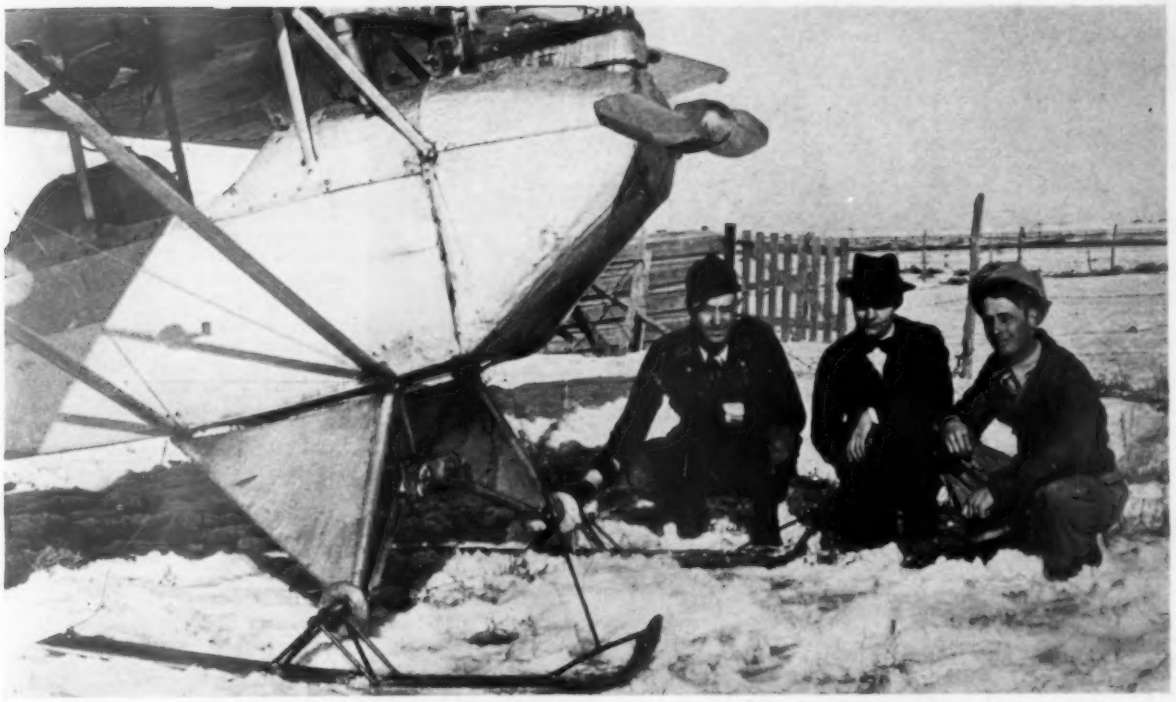
Mechanics can service (above) and re-arm (right) Vultee "Vanguard" in few minutes.

THE Swedish air force will be getting a highly novel fighter in the Vultee *Vanguard*. First, the *Vanguard* mounts no less than 10 machine guns; second, it can be stripped down for servicing in two minutes flat, as is shown in the picture directly above. In a recent test, four mechanics were waiting for the *Vanguard* as it taxied up to the line. The pilot wasn't out of the cockpit before side panels had been removed, exposing armament, fuel system and flight controls. A few more minutes and the ship was completely serviced and ready to take the air again. Another Vultee novelty is the fact that the *Vanguard's* gun barrels are quickly replaced without moving the gun itself. Inset shows quick change of guns. *Vanguard* has eight .30 caliber and two .50 caliber guns.

## Horse-Drawn Bombers

BECAUSE of a technicality in the American neutrality act, the small town of Emerson, Manitoba, Canada, has become a bee-hive of aeronautical activity. The neutrality act forbids warplanes to be flown across the American border into Canada for delivery. So American pilots land their ships on the American side of the border, a team of horses pulls each ship across, and Canadian pilots take over and fly the ships to their new bases. So far, this procedure has been used in the delivery of Douglas *Digby* and Lockheed *Hudson* (below) bombers and North American *Harvard* trainers. Closest American town to Emerson is Pembina, N. D.

A team of horses pulls a Lockheed "Hudson" from the United States into Canada.



Left to right are Howard Holt, jeweler; Kenneth Crisp, plumber; and Harold Hawk, flyer-oilman.

# Homemade Hero

## by RICHARD MARTIN

**Several Texans owe their lives today to the fact that Harold Hawk yearned to fly so much that he built his own plane in his spare time.**

THE Noel King family almost froze to death in the blizzard-swept reaches of the Texas panhandle and their misfortune proved to be the bedrock upon which a new aerial reputation has been founded.

Harold Hawk of Perryton, Tex., emerged the hero of the little drama and today he's being touted as a candidate for Carnegie hero consideration—just because he's handy with his hands and loves to fly.

With a tiny homemade unlicensed plane equipped with a pair of homemade skiis he accomplished in the span of two days more aerial rescues and demonstrated more new uses for the airplane than the average pilot does in a lifetime. Hawk got on the hero trail when the Kings—Mr. and Mrs., Loretta, two years old; and Gracie Fay, seven months old—were caught in one of the swirling, biting blizzards that sweep across the Texas panhandle during the blustery winter months. Drifts had piled higher and higher on the highway and it wasn't long before the King automobile slid drunkenly into the ditch—hopelessly stuck.

The temperature stood at 10° below zero and the wind was blowing a 50 m.p.h. gale as the stranded family struggled to the protection of a pipeline "booster" station over a mile down the road. The girl's arms were frozen to the elbows and the baby's cheeks were frostbitten when they finally reached the shelter. A frantic telephone call to Perryton, 20 miles distant, and the Kings' plight was explained by the station attendant, who emphasized the need

(*Continued on page 76*)

This picture was made at Hawk's pasture-airport as he took off in his home-built Pietenpol monoplane. Hawk, Holt and Crisp built the skis—the first in Texas.

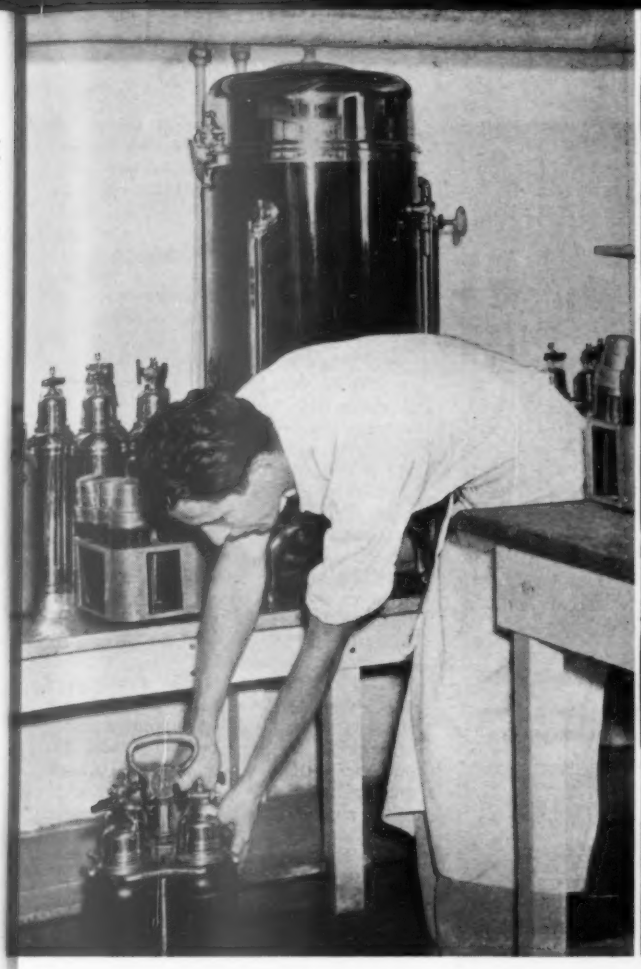
# SOUP'S ON!

Full-course meals are awaited eagerly by all passengers. Below, a Perrigo chef keeps close watch over broiling lamb chops.

COMMERCIAL airlines find that their food problems resemble those of mountain health resorts, to wit.: everyone who dines aboard an airliner finds his appetite stimulated. It's a matter of record that dispeptic individuals who usually pick over bowls of crackers and milk, will turn into ravenous gourmands when they sup aboard a transcontinental plane. One man whose weight dripping wet was not more than 134 pounds, ate five dinners in some nine hours of flying from Denver to New York City.

The most extraordinary flows of gastric juices seem to be generated by the thin, pure air above 8,000 feet where most of the big transports fly. The late Will Rogers used to comment on the effects of flight on appetite every time he got to talking aviation. Will used to say that instead of flying cross-country he always ate his way across when he rode in the open-cockpit biplanes of his heyday. He always said that the weakest stomach gains strength when the altimeter shows 10,000 feet and the airspeed indicator 110 m.p.h.

Physicians and psychologists say there are several reasons for this. A feeling of well-being is developed by a calm, peaceful flight in the most self-centered, troubled or irrascible persons. They point out also that the airlines, dealing as they do in first class transportation, have always made it a point in recent years to serve food of the best quality. Finally, they say, the airlines have been blessed at certain key centers by having



Hot coffee and soup go into the thermos jugs at left. Directly above, complete meals arrive at the airliner's door for loading.

**Feeding folks in mid-air is a modern science all its own. Mrs. Frances Perrigo is a pioneer in the art. Her specialty is anticipating what the high-flying passenger craves for dinner.**

## by DeWITT WENDELL

their vacuum ovens and thermos jugs filled by master cooks. The combination is irresistible.

For years the name Perrigo has been one of the most famous in airline circles for food. The bearer of the name is Mrs. Frances Perrigo—a slender, pleasant young woman whose one outward sign of her ability is her firm jaw and steady gray eyes. Her headquarters always have been at Chicago airport, and since 1933 she has prepared or watched over the preparation of nearly all the meals placed aboard airplanes out-bound from this port. If you have ever eaten a meal soon after leaving Chicago's field you probably have eaten one of Mrs Perrigo's special aviation dinners.

Mrs. Perrigo's story is typical of the airline industry. From a modest beginning she has expanded her catering until today it has become a sizable business with a staff of about 30 persons. It requires her full time as administrator, overseer and buyer. She has seen the air transport industry develop from the days when passengers sat on mail bags until today when they are given every possible luxury in the air and served full meals with china, glassware and silver.

Nor is this any summing up of Mrs. Perrigo's career. Today, as vital as ever and with a lot more knowledge of what the public and the airlines expect in the way of foods than in the beginning, she is preparing herself and her kitchens for the feeding of those of us who will be riding huge four-engined airliners that will be flying national aviation routes from this summer on. Like everyone else in aviation she is looking to a rosy future.

But let's begin this story at the beginning. The winter of 1932 found Chicago's field busy with the "super-airliners" of that day—United's now obsolete Boeing 247s were just being delivered and the rest of the airlines on the port were using Fords, Stinsons, Curtiss *Condors*, single-engined Pilgrims, a few Lockheed *Vegas*, and some Travel Air mail ships. The operators were having their troubles keeping the airplanes flying. Traffic departments were non-existent or merely were in the bud stage. None of the lines were worrying about commissary departments, and "passenger-comfort" was a phrase that was just gaining some significance. United's stewardesses still were a nine-day wonder.

Mrs. Perrigo's place in this picture was not an important one. She was struggling along trying to operate the Clearing hotel at 5524 W. 63d Place. This was a private home she had remodeled into a hotel. She was catering to pilots and field crews who wanted to live close to the flying field. The hotel was conveniently located less than 150 yards from the southern airport boundary and she was beginning to have considerable business from flying folk.

From conversations with these airline

Mrs. Perrigo (left) checks all food before it is delivered to the airport. She is shown examining a box lunch to be placed aboard a short-hop or "milk run" passenger ship.

The Perrigo establishment occupies this large house. As the airline catering business expanded the building grew to its present size. Cooking equipment cost $7,000.

Ready to go to the airport, the prepared food gets quick handling between the Perrigo kitchens and airliner's buffet. Mrs. Perrigo's unique business started in 1932.

employees she learned that several of the companies were considering the notion—then a radical idea—of providing hot drinks (tea or coffee) and perhaps hot soups for passengers. After thinking over the matter for a few days Mrs. Perrigo applied to United Air Lines and obtained a contract to leave a thermos jug of hot coffee with every departing plane. Her business was launched.

Soon she was selling coffee to all the lines. Then one progressive traffic department ordered her to prepare a tray of sandwiches to be served with the coffee. They were delicious—the writer has eaten many of them—and by the end of 1933 Mrs. Perrigo was under contract to supply food to all the companies using the field. She now considers that this service was pretty crude. But for the times it was adequate. The present ideal of luxury in the air had not filtered down to the operations end of the airlines and few of the traffic officials were dreaming of the possibilities that already have been fulfilled.

Most of the cooking in those days was done by Mrs. Perrigo and her brother, Ed. They prepared a daily average of 60 jugs of coffee and 350 sandwiches. They had an old Packard touring car that Ed used to drive over to the airport terminal whenever a plane was scheduled to leave. In addition to the cooking, Mrs. Perrigo was studying dietetics and trying schemes to improve the quality of her food. She also began, with the help of the airlines themselves, some of the first surveys ever made to determine what kinds of food airline passengers liked.

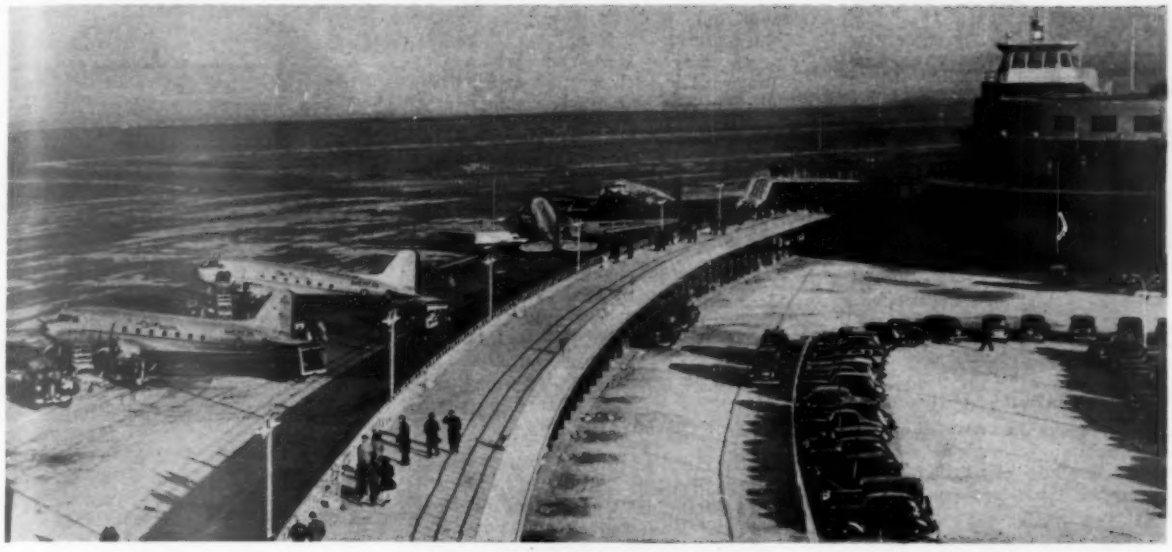
She says today that she learned the hard way. However that may be, she and the airline commissary department heads learned together. The airlines conducted the surveys by printing up forms containing the questions that Mrs. Perrigo prepared. The answers to these questions supplied much of the information upon which today's more complicated and tasty air menus are based. As in other businesses, the airlines and Mrs. Perrigo believed the customers were right and trimmed their catering to customers' desires.

"I always felt," she says, "that despite the hunger that seems to be universally present among airline passengers, they should not be given heavy food of the types they might be tempted to order when hungry on the ground. After all there is no physical exertion to riding in an airplane and the stuffy feeling inevitably following a heavy meal is decidedly uncomfortable.

"The result has been that we have been forced to provide light meat—fowl chiefly—to fit all palates and ages. We have been forced to use fruits, salads, and fluids. Potatoes are a recent innovation. They were taboo for years because of the lack of facilities for keeping them piping hot. What could be worse on your plate than a chunk of cold mashed potatoes?"

Mrs. Perrigo always is wracking her brain to provide tasty novelties that are

(*Continued on page* 78)



New York's $40,000,000 airport has charges for everything from parking your car to looking at the airplanes. Airplanes pay landing fees and there are paid tours.

# The WAIL OF TWO CITIES

## By EDWARD FISHER

### Concluding the chronicle of the heated battle between Newark and New York airport interests.

SOME three years ago a private airport lay on the muddy Long Island tract that was North Beach. Today, stretching in a mile long arc stand six hangars, each larger than Madison Square Garden, separated in the middle by a four-story administration building bearing the legend "New York Municipal Airport."

This is Fiorello H. LaGuardia's dream —a dream that began humbly in 1934 and grew by gargantuan leaps until in 1939 it was a full-scale vision to him and a nightmare to the taxpayers. From an original estimate of $12,000,000 in 1934, the expenses sprouted until the final cost is expected to be more than $40,000,000.

The airport he built still is a source of wonder to airline men. It was constructed to conform to the needs of commercial interests only and on such a large scale that it has unquestionably become the premier airport of the United States. To New York's mayor this is a triumph over political opposition, private criticism and over New York's bitter rival, Newark.

Nor has the North Beach airport ceased to be a storm center. It is unique not only in its physical makeup, but in that it was constructed from public funds for the exclusive use of private industry. Although private flyers are not barred from using the airport, a landing there costs the owner from $2.50 to $50, depending on the

Newark's main fault was that its passenger-handling facilities were inadequate. Compare the loading area below with ultra-swank facilities at New York Airport (above).

Mayor LaGuardia of New York.

gross weight of his plane—and storage charges go into effect if the plane is left on the grounds for eight hours or more.

The manager of the field for New York has this to say on the subject: "Private flyers are allowed here strictly by tolerance—and then only if their planes are equipped with two-way radio, brakes and tail wheel. It is only a matter of time until we will find it necessary to bar private operators from this airport entirely."

That policy has brought LaGuardia Field unrestrained criticism from the ranks of pleasure pilots who believe that any municipally-owned landing field should be open to all who desire to use it, from plane-owning businessmen and from Newark supporters, who are ever alert for weak spots in New York's defense. The Army Air Corps recently "banned" North Beach for attempting to charge the Government for each landing of a military ship.

According to its manager, North Beach virtually is the only municipal airport in the country that will be profitably owned. Whereas the airports of most cities are built and maintained at a loss, North Beach will not be a white elephant to New York's taxpayers. With an estimated annual income of $800,000 compared with an operating cost of $150,000, the apple of "Butch" LaGuardia's eye will be able to retire the $15,000,000 investment of the City of New York and pay a fair rate of interest on the bonds. Although the airport cost $40,000,000, 25 of them were grants from the Federal government in WPA funds and will not be repaid.

"This airport is a guinea pig, an experiment in airport operation that should point the way for cities all over the country to manage their fields so they won't be an open sore in council meetings," says the manager.

There is some sardonic humor in the plight of citizens who dig down for $40,000,000 to build an airport, then pay 25 cents to park their cars and another 10 cents for admission to the spectators' ramp to see what they've been paying their taxes for. But there have been no serious complaints to date. The turnstiles that admit visitors onto the elevated walk are expected to click a million times and net New York $100,000 during 1940.

The City of New York, which is experienced in such matters, isn't missing any possible source of revenue. In addition to the charges mentioned above and the enormous rents paid by the airlines for hangars, ticket counter space and landing fees, the city will collect $90,000 from the Hotel New Yorker for their exclusive restaurant rights this year. The contract calls for a percentage of gross income, with a guaranteed minimum. The Grand Central Cadillac Renting Corp., which operates coaches from the downtown area, has a similar arrangement, paying 10 per cent of gross income but not less than $15,000 per year.

Each taxi entering the grounds is assessed 10 cents, and visiting crews taking the crew car into their New York hotel contribute 25 cents a head to the field's upkeep. By the end of March the city was conducting guided tours through the airport for a per capita consideration of from 25 cents to $2. The city wanted to sell the rights to operate a porter service to a concessionaire, but the airlines were so horrified at the thought that they formed the Airline Terminal, Inc., and themselves employ porters, information countermen, guards and washroom attendants, paying them good enough salaries so that they aren't overly tip-conscious. That left the city off with only 75 permanent employees.

While the airlines are accustomed to having landlords at other cities supply many conveniences without charge in return for the business and prestige they reap from being stopping points on large airlines, New York is not so overwhelmed by the honor that she is losing money on the proposition. American Airlines is even billed at the rate of a dollar a landing for using its single-engined Stinsons for pilot checks. There is a wharfage charge for gasoline of two cents a gallon. The airlines have balked at paying this extra charge and are appealing the case.

There is plenty of evidence that the airlines got into the fire deeper financially than they had ever imagined when they moved to North Beach. For instance, there is the $15,000 annual rent for Post Office facilities which they have to assume; a new project to wall in the rear side of the passengers' ramp, which will make a completely covered sidewalk for arriving and departing passengers to use in going between plane and administration building and which runs into several thousands for each airline; landing fees for scheduled flights that cost: $200 for each of the first three schedules, $100 for second three, $50 for third three, $25 for each additional schedule.

A high airport official sums it up this way: "The airlines are getting the gravy and they're paying for it. The passengers can drink a cocktail at a refined bar; grab a sandwich in a clean, airy coffee shop; eat a dinner in a beautiful dining room that runs around the front of the

Mayor Ellenstein of Newark.

administration building and has an unrestricted view of the field—but they pay for it. The spectators are seeing a show the likes of which they can't see elsewhere—and they're paying for it. This is a big league airport, and it's run along big league lines."

Indignation over the landing fee and storage fee as well as the requirements for two-way radio and brakes has run rampant through the ranks of private flyers. Mutinous plans are advanced by independent groups to test the city's authority to collect the fees and habitues of Flushing airport, Roosevelt Field and the other Long Island ports deem it highly probable that the validity of the North Beach laws will be tested in the courts this summer. No group has yet been organized to finance such a venture, but feeling is running so high on this subject that action of some sort will certainly take place with the advent of good weather.

Although aware of the attitude of pleasure pilots, the field manager claims to have nothing against them. "They just don't have the long view; they don't understand what we are trying to do." Regardless of the prejudice against the unscheduled pilots, $50,000 will go into the building of a small hangar to service itinerant planes. "This," the airport director explained, "will be used to store motorized equipment and maintenance materials after private planes are entirely excluded from the field."

Although North Beach has so far escaped any legal squabbles over spectators' rights to watch the activity and has had no court trouble from private flying sources, the airport has not gone through a spring and summer, when both spectators and sky flivvers abound. North Beach may be the scene of some pretty fireworks by the Fourth of July.

The City of Newark, though, has not done anything to make for peace and quiet at North Beach. If anything, the decade-long fight between Newark and New York has gained new life through the airlines' move to Long Island. The feud flared anew when New York proposed to build an airport that would lure commercial aviation interests to the

(*Continued on page* 80)

# I Learned About Flying From That! No. 14

## by Lieut. W. A. Burton

CONFUCIUS say "Complacency worst evil of aviation." I say Confucius is as correct as hell, even though he didn't now a gasoline system from a radio. It seems to be a failing of us mortals to be skeptical of all advice, no matter how authoritative the source. This weakness of human nature got me into a situation I will not soon forget. My companions, both of whom were flyers, must have suffered the torment of the damned since they could only sit and squeeze.

The three of us—Dental Surgeon David Cooper of the U. S. Public Health Service, the late Lieutenant Bill Schissler of the Coast Guard and yours truly—had set out for Key West from St. Petersburg, Fla., in a Fairchild "24," landplane on official business. We hopped over the Everglades and sat down at Miami to top off the gas tanks, in order to avoid the difficulty of getting gasoline at Key West. The Fairchild holds 40 gallons and burns something less than 10 gallons an hour, so I figured there would be ample reserve for the 275 mile round trip. The flight south along the beautiful Florida keys was uneventful, although given to some contemplation and light banter concerning the lack of even a remotely possible landing spot along the line.

Lieutenant Burton

*For a few tense minutes the author, a Coast Guard flyer, faced danger because he had neglected to study his airplane.*

We had completed our business in Key West and were returning to Miami. Doc Cooper, an irrepressible flying bug whom I expect any day to command a flying dental office (he now has one on wheels), had taken over the stick with instructions from me to glue his nose to the narrow highway and follow it into the mainland. The weather was excellent, although we had a 15 to 20 knot (17 to 22 m.p.h.) headwind. When we left Key West we had a little more than half our gas supply left. The little Ranger engine was running like a sewing machine so, without a care in the world, I dozed off for a cat-nap, leaving Cooper to admire the palm-studded strip of narrow coral keys below us. I had spent many hours gazing at this same string of islands looking for smugglers and alien runners in the past but generally with a boat or floats under me. In a seaplane it is possible to glide to a safe landing in any of the little lagoons on the Gulf side of the islands. In a landplane it is another story—but we were in a brand new ship and behind a pretty reliable engine, so why should we worry?

I had been dozing about an hour when Cooper nudged me in the ribs and exclaimed, "Archie, the gas looks mighty low." We were somewhere half-way between Key West and Miami—and not a landing field in 60 miles. A hasty glance at the "sight gauges," which are generally pretty accurate, convinced me that Cooper was not exaggerating. Each float indicator was dancing up and down on the bottom of the tank gauge in a tantalizing and sickening fashion. We simply could not have used 20 gallons in an hour! Something was rotten up there over the Florida keys. The gauge floats wiggled just enough to convince me they weren't stuck. The only possible source of trouble was a leak in the gasoline system.

The engine still was kicking over regularly and we had 1,500 feet altitude and about 60 miles to go to Miami. A damned long glide even in a sailplane! One thing was certain: we had to do something and that mighty soon. The Ranger engine is an economical little percolator, maybe we could make the mainland on the remaining two or three gallons. The thought of spending two or three days walking 20 miles out of the Everglade country knocked that idea out of my head.

If you've ever flown down to Key West you may recall that the road is narrow, that a line of telephone poles line one side and a heavy growth of mangrove the other, and half the distance is a very narrow bridge connecting the adjoining keys. The motor vehicle bridge that now is open was just under construction at this time. The beach is non-existent. Where the beach ought to be is jagged coral rock and, on this memorable day, a nice surf was running. There was an outside chance that we might get down safely on the road. On the other hand, the wind was about 45 deg. off the road and a slight error in judgment or a ground loop meant a washed-out airplane. I took over the controls from Doc and eased down to 500 feet to have a good look at the road, expecting the engine to cough any minute. Doc Cooper and my other unfortunate friend were voicing a stream of comments combining forced humor, encouragement and hair-brained advice intended to imbue me with assurance and confidence. I feared the cold sweat standing out on my forehead would expose my inward panic to my companions at any moment. I was admittedly on the jittery side. The thought of explaining a cracked-up, new airplane with the flimsy and unforgivable "out of gasoline" excuse was unbearable, to say nothing about the utter deflation of prestige at my station.

Well, we strafed the highway for about five minutes and just about decided it was no go. As we headed for an area of blackjack that I hoped would cost us no more than the landing gear, I sighted what looked like an old Florida boom days "super de luxe" gas station. In front of the gas station there was a strip perhaps 200 feet long additional clearance. At that particular moment that 200-foot strip looked as inviting as Floyd Bennett Field to a flying neophyte.

(*Continued on page 72*)

Davis' airfoil is the keystone of the Air Corps' new Consolidated B-24 bomber.

# MYSTERY

By
## HAROLD KEEN

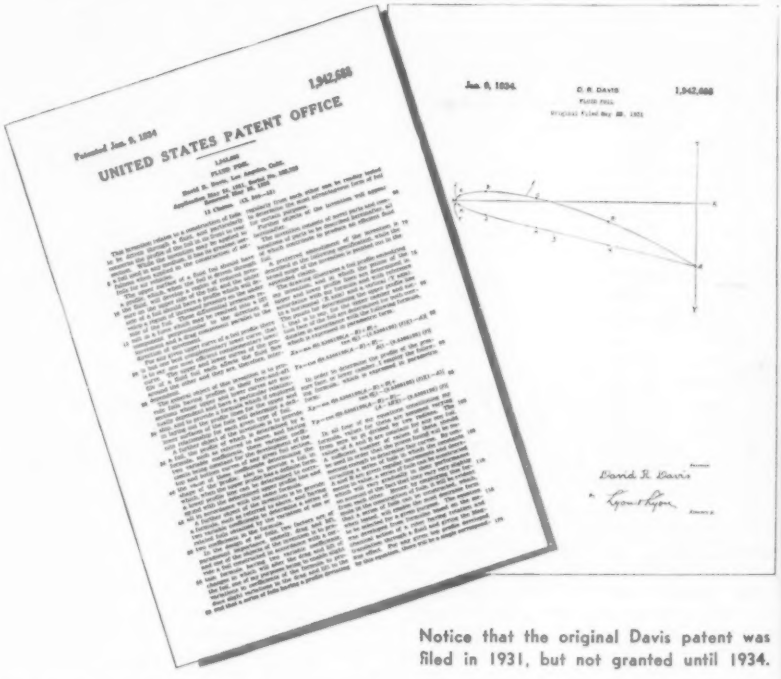
**Uncle Sam may rule the skyways because of the work of a lone, scorned engineer. His new wing section astonished aviation authorities.**

HE'S not listed in "Who's Who" and that's all right with David R. Davis, notwithstanding the fact he has solved an aviation riddle which defied the most brilliant aeronautical engineering minds since that incident at Kitty Hawk.

"I'm just a little fellow trying to get along," he comments, shunning a place in the Hall of Fame which ought to be reserved for "little fellows" who profoundly affect the study of aerodynamics, set the academicians back on their heels and show an incredulous world that what once had been considered the ultimate in combating flight's greatest enemy, air resistance, was hardly more than a modest approach to the problem.

That's by way of introducing David R. Davis, as modest a gifted individual as ever graced this earth. If posterity, despite the "Who's Who" oversight, remembers him only for the development of the Davis airfoil, a hard-won immortality will be his.

This is essentially the story of that airfoil and how it has jarred aeronautical engineering, but it cannot be disengaged from the story of the little-known man who conceived it. Davis, a bespectacled, mild-mannered gentleman who today occupies a small, easily accessible office on a quiet Hollywood street, recalls that he has always been a "nut on aviation."



UNITED STATES PATENT OFFICE

Notice that the original Davis patent was filed in 1931, but not granted until 1934.

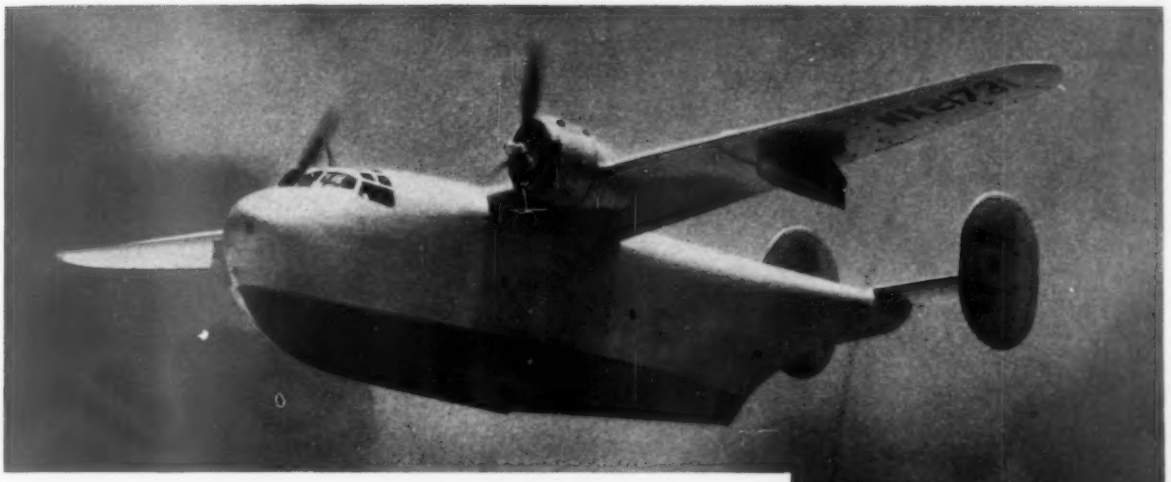
Originally he set out to be a barrister, duly completing the law course at Vanderbilt University. But he soon discovered that law practice and law study registered totally different appeal and the bar held out no lure for him.

Aviation somehow gripped him from the start.

"I was one of that generation born with the urge to fly and build airplanes at this particular moment in world history," he comments.

The handicap of defective eyesight possibly contributed in pointing Davis toward his destiny as one of the world's finest, self-taught practical aerodynamic experts. It has kept him close to the drafting board and out of the cockpit most of his life. He was refused enlistment in this nation's air forces during the World War and was cast in the humble role of infantry private. But the love for planes flamed with undimmed vigor through the years.

Early in the '20's Davis was in possession of funds looking for a place to roost. With Bill Henry, then an ambitious young journalist (now columnist for the Los Angeles *Times* following a



First plane to use the Davis airfoil was the Consolidated Model 31 flying boat.

# AIRFOIL

David R. Davis

period as correspondent with the Royal Air Force on the western front), induced Donald Douglas to come west early in the 1920's. The luster of Douglas' present-day fame has obscured his transition from status of employee to employer. He owes his start in manufacturing to David R. Davis and his continuance in this field to Bill Henry (see POPULAR AVIATION, November, 1938).

Douglas then was chief engineer for Glenn Martin, with whom he had moved east from the original Los Angeles plant. Both Henry and Davis knew him well, the former idolizing Douglas as the greatest engineer of his day.

The Davis-Douglas Aircraft Corporation was formed and the famed *Cloudster,* first Douglas transport, was built—with $30,000 of Davis' money. He also financed engineering of the first major Douglas military ship, the DT torpedo plane. But before the production order was received, Davis saw himself bucking against a stone wall. He went to Washington, observed at close quarters what seemed insurmountable difficulties in dealing with stubborn authorities. "I realized I wasn't big enough," he declared. And he severed his now historic connection with Donald Douglas. The Davis finances could go only so far.

Two persons made it possible for Douglas to continue. One was the rampaging Billy Mitchell, who shattered the monopolistic trend of Army and Navy aircraft orders and breathed new life into such struggling independents as Douglas. The other was hero-worshiping Bill Henry, who "sold" Douglas to his boss, Harry Chandler, publisher of the Los Angeles *Times.* Chandler and fellow financiers raised the necessary cash to keep Douglas in business and eventually his first large military order was received by the man who now heads the nation's most gigantic aircraft enterprise.

Thus ended David R. Davis' career as a financial "angel". He had turned over all the good will and assets of the Davis-Douglas Corporation to his friend, Don. Lock, stock and barrel the concern changed hands (Davis had been sole owner until then) without a penny involved. The money sunk into the experimental work on the DT was, however, ultimately repaid by the prospering Douglas.

In this unpromising manner began the most significant—and present—phase of Davis' career. He became a lone wolf engineer, operating much of the time only with his own unorthodox ideas for company. For a while, late in the 1920's, he was employed by the Bendix Aviation Corporation, where he developed the first variable-pitch propellers without mechanical control. He toyed with an automatically stable ship, abandoned the notion when it was found less practical than the controllable type.

He never lost his primary interest in wings. This plunged him into the vortex of a behind-the-scenes struggle—one in which he has been engaged since the Davis airfoil told the N. A. C. A. and most aeronautical engineers they may have been going up a detour in their search for the "perfect wing".

As long as man has been able to fly, he has been intensely concerned with the airplane wing. "In the old Curtiss days," Davis reminisced with a smile, "everybody had a secret wing section in his hip pocket. He guarded it with his life."

Davis was no exception. He always wondered what made the wing lift an airplane. What did a wing curve do? How did it function? And when he asked that question he came upon a conception as simple and yet as startlingly beyond man's thinking habits as Newton's discovery of the law of gravitation. A curve, he perceived, was not a dead geometric figure. *It was a living, mechanical, operating thing.* On the basis of this, he could not but depart from what now seemed an archaic process of obtaining the most efficient curve for an airplane wing — the so-called "cut and try" methods.

The oldest approach to this problem was by taking a wooden "blank" or board and sandpapering it down to different shapes, trying each in the wind tunnel until the best shaped wing was evolved. Truly hit or miss. An improvement on this technique was established by the National Advisory Committee for Aeronautics, which sought an airfoil sys-

(*Continued on page* 64)

# The DEADLY SHOW-OFF

This lightplane was rented by a young flyer who stunted and hedge-hopped just above housetops.

## By JOHN C. A. WATKINS

***Reckless, grandstanding, inexperienced pilots have given a shocking accident record to private flying.***

EVERY neighborhood has had its human jackass, who managed somehow to own a cheap roadster or motorcycle which he covered with snappy slogans and all the shiny horns and chrome-plated accessories he could get his hands on. He filled the machine with equally empty-brained females and roared through the streets of his community with complete disregard for all traffic laws and of the lives of his suffering fellow citizens.

This hairy animal still is with us, unfortunately. But today he flies an airplane and is, consequently, a much more serious problem than he ever was in the days when the speed mania was confined to the ground. Intelligent men and women, taking to the air in ever-increasing numbers, realize that their sport basically is dangerous but know that care and discretion may minimize the ever-present element of risk.

The lunatic fringe of perpetual adolescents who are giving private flying a black eye seem to be mentally incapable of understanding that an airplane can be as dangerous to them and to the public as a rifle in the hands of a crazed criminal. The result is that they take a few lessons—which give them only a reasonable chance of taking off, circling the field and landing safely — and promptly assume that the old fuddie-duddies who are the leaders in aeronautics really are just has-beens.

These mail-order aces invariably begin their murderous careers by taking their friends aloft as soon as they have soloed. Sometimes they don't even wait for that time. They completely and utterly disregard the Civil Aeronautics Authority's regulation forbidding solo pilots to carry passengers; their principal purpose in "learning to fly," apparently, is so that they can show off before their friends. Inviting a girl, in the presence of other youths who haven't "learned to fly," to come out to the field for a hop is an impressive gesture to the average person. It can't be resisted by the people who are giving the Air Safety Board such a headache.

Naturally, there are fatalities. If these people don't show off by stunting with unauthorized passengers in their ships, they head for the girl friend's home—which always seems to be in a heavily populated residential district—and show off by stunting over her house. The chances are that they will kill themselves through sheer lack of ability to control their airplanes. But the most unfortunate part of it is that once in a while one of them is going to crash into a home or a playground and kill some of the neighbors' children along with himself.

There was one such incident recently in Baltimore. This case involved a 19-year-old youth, with 10 or 12 hours' flying time, who headed for his girl friend's home one afternoon and began

This pilot tried to "beat the light" just once too often—and much too low for safety.

performing aerobatics at an unusually low altitude. Unfortunately for him—but fortunately for the people in the neighborhood—the girl happened to live just a few blocks from the home of Major Charles A. Masson, commanding officer of the Maryland National Guard aviation section and secretary of the State Aviation Commission.

Major Masson promptly took the airplane's license number and policemen were waiting for the youth when he landed at the municipal airport. He was hauled into a police court and given a long suspended sentence with the stipulation that he remain out of airplanes until the sentence expired. During his hearing, he swore that he had been flying well above the minimum altitude stipulated by the Civil Aeronautics Authority and the aviation laws of Maryland; it was with difficulty that Major Masson, an officer of many years' experience as a pilot, convinced the magistrate that he was capable of deciding from watching him from the ground that his actual altitude was *less than 300 feet.* Incidentally, as Major Masson pointed out, the only place he could possibly have landed in the event of engine or structural failure was a public playground which, at that time, was crowded with children.

This experience turned out well for all concerned. It kept the boy out of the air long enough—it is hoped—to convince him that the Civil Air Regulations are pretty sensible laws designed for the protection of himself as well as others. It helped convince other pilots that Maryland means business when it says that the state air laws should be observed.

Unfortunately, an official of the State or the Federal government can't always be present to observe violations and see that the violators are punished—for their own protection and for the protection of the aircraft industry. The result is that hundreds of pilots, who apparently can't be convinced of anything, are flying without adequate supervision and their violations are resulting in dozens of fatal accidents which are unnecessary and avoidable.

One such accident occurred in Baltimore a few months ago, killing a youth and a friend who accompanied him on the flight. This fellow, it turned out, had bought himself a few hours of dual time from an able instructor, then had managed to scrape enough money together to buy a little ship. No sooner had he done so than he began carrying his friends in the airplane, ignoring not only the Civil Air Regulations but the express orders of his instructor and the operator of the field. He had the habit of making steep climbing turns without using ailerons and constantly was being warned by his instructor that flat turns some day might kill him. Finally, his conduct was deemed so dangerous that he was ordered to remove himself and airplane from the field. A few days after he transferred his activities to another airport, he spun in. Result: two unnecessary deaths, another black eye to sport flying. Investigation disclosed no structural or engine failure, but did show that he began activities on that fatal day by performing power stalls at 300 feet—in itself enough to make a seasoned pilot shudder—and then made a flat rudder turn at an even lower altitude. As might have been expected, he fell out of the turn into a left spin and hit the ground in a power-on dive.

Just a few hours after the pair crashed to their death, two airplanes collided while taking off at another airport a few miles away. No one was injured, but out of the investigation came the disclosure that one of the pilots (who was not at fault, incidentally) was a young Army officer who had only a solo certificate. He had a girl in the ship with him and was found guilty of three separate violations of the Civil Air Regulations. Only fate prevented this accident from resulting in a fatality.

An unusual but outstanding example of what the Authority has to contend with is the case of Bruce L. Dunbar, a 19-year-old student at the Massachusetts Institute of Technology. Last January he was denied a pilot's certificate because his record as a motorist was so amazingly bad that the Authority was forced to come to the conclusion that he would be an equal menace to public safety in the air.

When Dunbar originally was denied the certificate, he asked for and obtained a hearing which was held in Boston before a C.A.A. examiner. At the hearing it was brought out that the youth's record showed that he had been guilty (during the past two years) of eight speeding charges and four other traffic violations in Massachusetts and New Hampshire and that "his driver's license had been suspended or revoked, in one state or the other, five times." He pleaded guilty to one charge of lying in the middle of a street at two o'clock one morning in an intoxicated condition. Listen to what this youth, who thought he had a right to fly an airplane, said at the C.A.A. hearing:

"The Newton (Mass.) police and I have been having a duel for some time in which I generally come out the loser. I have developed a dislike for them as a class of citizens and, perhaps foolishly, I attempt to antagonize them every time I see them. That was such a case. First of all, I was coming toward an accident which had just happened down about a half a mile from where I was, and I saw the police car coming from the

(*Continued on page* 86)

The Santa Maria Lockheeds are sometimes used as trainers but mostly by Captain Hancock himself.

# Aviation's PATRON SAINT

by EDWARD CHURCHILL

G. Allan Hancock is wealthy and has high hopes for the air-minded youth of America.

THE Lockheed "14" streaks high above the green hills of California, bound from Los Angeles to Santa Maria, 130 miles away. At the controls of the ship is a clean-shaven, square-jawed, firm-lipped man of 64 years. His sturdy figure, his unlined face, give the lie to Father Time. He looks 10 years younger than he is.

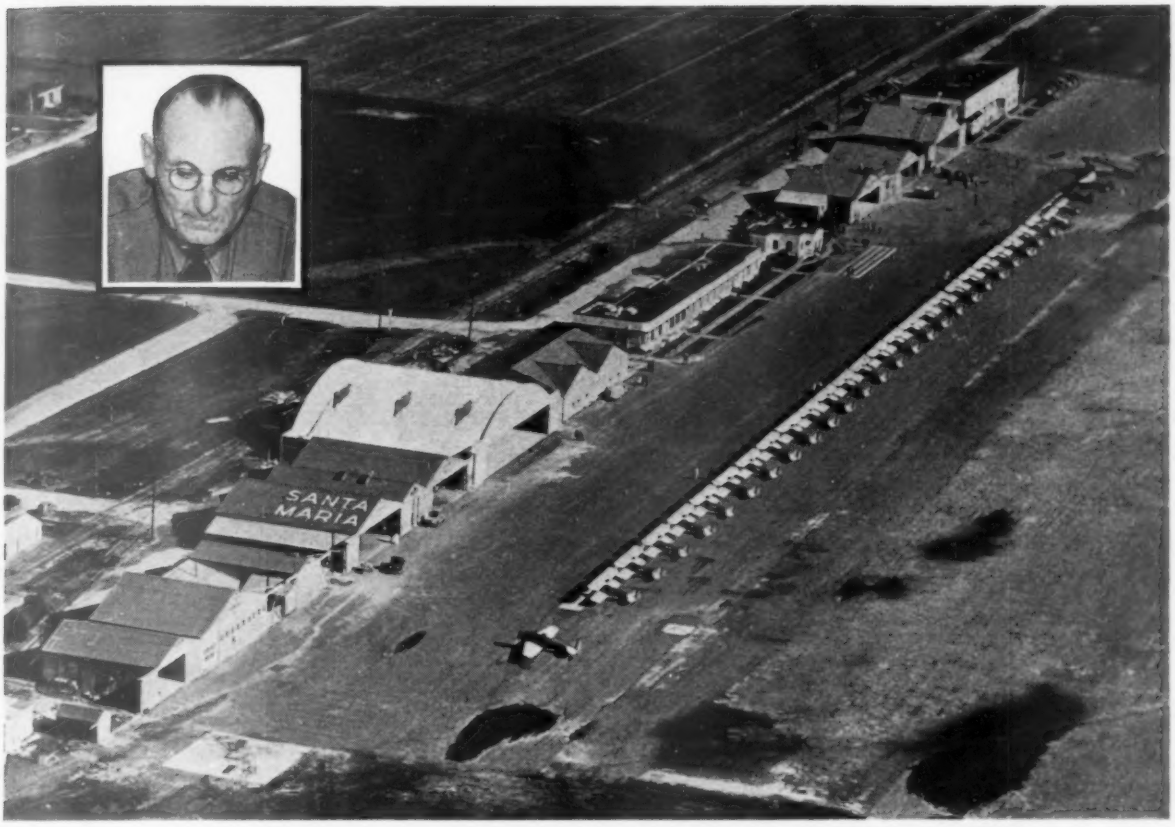
He's a veteran of 12 years of flying in all kinds of ships under all conditions. At this moment he is commuting from his home in Los Angeles and his ranch in Santa Maria. In his wallet is a private license. In his log book is a neatly written record of more than 2,000 hours in the air.

That he is a skilled pilot at his age is remarkable. Few people know of his record because of his inherent modesty. What is more remarkable is what he has done for aviation down through the years in his quiet way.

He is G. Allan Hancock, one of California's most famous men—a man who, among other things, is a locomotive engineer, holder of a union card for many years, a marine captain who holds a license to navigate a ship of any tonnage on any ocean, member of the musicians' union and master of the cello, president of a university board of trustees and, from 1901 until 1924, a skilled oil rigger and driller.

In addition to all this he's many times a millionaire. He wasn't always one and that's part of this story, for it explains his generosity to youth. In fact, as a boy, the going was pretty tough for him. His parents owned property west of Los Angeles and southwest of Hollywood. He used to dig "brea", an oily substance, from the ground, haul it to Los Angeles and sell it for $1.25 a load. Later, the "brea" was discovered to be the source of great wealth. Nearly everyone has heard of the "La Brea pits," which have yielded the bones of prehistoric beasts. This was Hancock property, known as the Rancho La Brea. But, when the captain was a boy, it was worth next to nothing.

Thirty-nine years ago the Hancocks started pumping oil. But there wasn't a great market for it in those days. Hancock was nearly 30 when the money first started to roll in from oil. And the property didn't become valuable as real estate until 1915. Hence, knowing how hard youth must work and realizing how much easier his boyhood would have been had someone lent a helping hand he, today, helps young men who want to learn aviation. California




**The Santa Maria school is practically a one-man show and Captain Hancock (inset) is the man. The school now is training students for the Army; its contingent of Stearman PT-13's are shown on the line.**

guesses as to how much he's worth. It runs into the millions. Today, he no longer has income from oil. But he has extensive investments, owns the great ranch at Santa Maria where his Hancock Aeronautical College is located and has large banking interests.

All this is quite impressive. But he's found time for aviation, to learn to fly, to buy planes—he has been one of the largest individual purchasers of planes and equipment in the country—to sponsor an epochal flight, to found an airport, to establish the flying school at Santa Maria and to help youth learn to fly. The school is being described as being operated "more for patriotic than commercial reasons," which is a modest way to set forth the captain's generosity.

The captain, as he is affectionately known to those associated with him, learned to fly as the direct result of backing the flight of Sir Charles Kingsford-Smith and Capt. Charles T. P. Ulm, Australians who flew the *Southern Cross* to Australia. They were stranded in California without funds and with a mortgage on their Fokker when they met the captain. They took him for flight in the ship. Always interested in anything mechanical, he was fascinated by the controls.

"You take the wheel, captain," Sir Charles suggested.

The captain took over and flew back and forth above Los Angeles. He admits that although he was okay on the straightaway he was ragged on the curves. Today, he says:

"That flight convinced me that I ought to learn to fly. I realized that a great deal of training was necessary to make an aviator. So I decided to go to school. I've virtually been in school ever since, flying all sorts of ships and I still have plenty to learn."

More important to aviation was that he felt others should learn to fly, particularly able and deserving young men who did not have sufficient funds to acquire a thorough aeronautical education. This led to the founding of the Allan Hancock College of Aeronautics, of which more later.

The *Southern Cross* flight from California to Australia is history. The captain simply let Sir Charles and Ulm believe he was loaning them money and taking title to the ship, but when they landed with their crew—Harry W. Lyon, navigator and James W. Warner, radio operator—he sent them a bill of sale. He explained that he'd backed the flight to restore public confidence after the Dole fiasco. His friends pointed out that he had waited until a safe landing had been made before presenting the plane and cancelling all obligations because he had not wished to minimize their pride and independence or weaken their purpose by oppressive patronage. This is typical of his policy in helping aviation and those connected with the industry.

**Pat Fleming**

This was just the beginning of a generosity which has never failed during the past 12 years—the kindly sort of giving which doesn't destroy initiative or carry patronage. And the captain, after flying up and down the coast and around Los Angeles and San Francisco on test flights in the *Southern Cross* really went to work to learn to fly.

He took lessons from Moye Stephens—later pilot for the explorer, Richard Haliburton—and Dick Rinaldi, now at Santa Barbara. His first ship was a Buhl *Air Sedan*. He had it equipped with every known instrument for navigation and with radio. Among other things, he has an avid interest in air communications. He engaged Pat Fleming as his staff pilot, an association which has lasted until this day.

"If flying is so interesting to me," he said, "it ought to interest others. Young men should have a career in it—learn to fly properly. To do so they need adequate training. Aviation is going to grow and mechanics, pilots and engineers will be in demand."

**The epochal flight of Kingsford-Smith to Australia in 1928 in the tri-motored Fokker "Southern Cross" was made possible by Captain Hancock, shown above with the ship.**

So, instead of building a private flying field for his exclusive use he bought land, put in the public Santa Maria Airport. Soon thereafter he built classrooms and quarters and the Hancock College of Aeronautics came into being. The school was founded late in 1928, started operating with full time classes in 1929 and continued to grow until 1933. During this period there were as many as 85 students at one time. There were more than a hundred graduates who quickly enough found places in the industry. The college trained its men as motor and airplane mechanics, draftsmen, designers, engineers and pilots with everything from solo to commercial licenses.

While graduates were being turned out in good-sized lots, the safety record was perfect. The college never has lost a student, a pilot or a plane in an authorized flight.

Graduates and students have included such men as LaVerne Brown, erstwhile TWA pilot, later John Trent of the movies and an Army Reserve pilot; Earl Ortman, once one of our leading race pilots, now with Canadian Colonial Airlines; Wayne Yarick, now a Lockheed engineer; Delbert G. Van Ornum, noted as meteorologist and forecaster with Northwest Airlines at one time; Roy L. Jones, now in charge of ground and flight training at the school, and W. B. Miller, Rudy Truesdale and Jim Moser, all TWA pilots.

Technically, the students have paid for their instruction. But, when a man has been naturally apt and deserving, he has always seemed to be able to find just the right kind of a job around Santa Maria—a job which miraculously has taken no time from his flight training and yet has provided him with funds adequate to continue his instruction, whether ground, or flight, or both. Again, just the captain's way of helping a man help himself.

But in 1933, the captain announced: "The activities of the school will be curtailed. The industry is in such condition at present that graduates cannot be absorbed. Until the improvement is general there is no use continuing with such large classes. It's not right to make aviators when there's no place to put them."

Curtailment didn't mean shutdown. The college continued to operate, but on a much smaller scale. This plan was continued until business began to pick up at the beginning of 1939. There had been times during the period from 1929 to 1939 that the college had boasted of 15 planes. The captain flew them all. At present, in the non-military division, there are a Ryan, two Stinsons (one Reliant and one "105") an Aeronca, Beechcraft, Monocoupe and two Lockheeds, one a "12" and the other a "14". Hancock, holding several weight ratings, uses the latter as his personal ships. Recently he flew one to Dayton, O., to confer with officials and Army officers about establishing one of nine Army training schools at Santa Maria.

"I welcomed the opportunity," he says, "because I felt that I could be of service."

The captain works 11 or 12 hours a day and doesn't have much time for joyriding. Most of his time is spent commuting, mostly between Los Angeles and Santa Maria on business matters. But he does get out to the field now and then for short flights on the other equipment.

The invitation from the Government to cooperate in training flying cadets for the Army Air Corps came in 1939. The captain, realizing that here was an opportunity for service, providing barracks, hangars, instructors, maintenance facilities, school rooms and administration and accounting offices. He increased his staff and added buildings with no thought of financial return. The present average of military enrollment is about 95 students, with a new group of 60 coming in every six weeks. The civil end of the school still flourishes, although it is now secondary to the military.

The military division is conducted under the supervision of Capt. E. H. Alexander and his staff. The entire organization is actively conducted by Captain Hancock, who retains his presidency of the Hancock College. The civil enrollment includes about 15 flying students and 60 ground school students. Under special arrangement with the state of California the ground courses are taught by instructors from the Santa Maria Junior College in the classrooms and hangars which the captain has built at the model airport.

Hancock says today that the sea is his first love. He's proved that with his many expeditions into the Pacific and his long, active identification with the maritime. But flying now means even more to him and it has challenged all his other interests. He finds time for his business; time to make music with his Hancock String Ensemble;

(*Continued on page* 90)

**This is part of the Army Air Corps detachment currently at Santa Maria. An average of 95 Army students take the course. The instructor above is Lieut. John R. Kilgore.**

These are the 12 members and the airplane that comprise the Cloud Club, Inc. Each invested $100.

# CLOUD CLUB

## by Tom R. Taylor

***Twelve St. Paul working men were so eager to learn to fly they pooled their extra dollars, bought a plane and started a club.***

SO you think learning to fly will nose over your budget and run your prop into the ground? Well, so did a dozen St. Paul, Minn., young men with average salaries—but they did not let the thought get them down. They found a way to learn that agreed with their modest earnings and are having a grand time about it as well.

They bought a ship, as the solution to their problem of cutting the high cost of flying instruction, their venture has worked so well that there now are five more groups within the Twin Cities (St. Paul and Minneapolis) organized on the same plan, each owning a ship. While there have been flying clubs before Cloud Club, Inc., they doubt if there have been any with a more satisfactory and practical plan than theirs.

The whole thing started back in the summer of 1938 when Arnold Melin, an accountant, began taking flying lessons in company with his friend Andrew Potter, a bookkeeper in the same office. The local rate of instruction was $6 an hour in a 40 h.p. *Cub*. Their enthusiasm soon attracted several fellow office workers to flying. As they progressed in ability at the stick, so did their desire to fly more. They began to look ahead at the cost of eventually getting solo and private licenses. The prospect appeared impossible to them at the moment for, with the required hours and at the rate the time and money was going they could not see how their salaries could be stretched to pay for the amount of flying necessary to reach their goal. Many another potential flyer has looked with despair at the cost and given up the struggle before obtaining his wings. However, these men had already gotten flying in their blood and determination in their minds. They refused to be washed out.

Individually and collectively they began to think of how to continue flying and have food on the table at home at the same time. They reasoned that if their flying instructor could own two *Cubs*, drive a good car, build a home and raise a family with the profits from only these two little ships, there must be a fairly wide margin between the cost of operating and the income from selling flying instruction. So they decided the solution to their problem was to turn this margin of profit to their own advantage. It was then that Mr. Melin came up with the idea of pooling their resources and buying a ship as a non-profit, cooperative enterprise. Consequently, during the early spring of 1939, the most interested men of the group began formulating plans for such an organization. They became acquainted with a former member of an intercollegiate flying club and, with his background and ideas of their own combined, there evolved Cloud Club, Inc., incorporated under the laws of Minnesota.

Beginning with 12 original members, who each invested $100, they purchased a "50" Lycoming *Cub*. Each man holds a contract assuring him of 1/12 of the equipment and treasury. His investment is protected by insurance to 80 per cent of valuation, plus a 25 per cent reserve fund in case of complete washout. Should a member find it necessary to withdraw, he is refunded his share of the original investment, less his proportion of the depreciation—and must procure a new member acceptable to other members of the club.

Cost of maintenance is taken care of by dues of $2.50 a month which pays for insurance, hangar rent, overhauls and depreciation. Their depreciation reserve fund is kept equal to the amount of depreciation. Cost of operating the ship is borne by each individual who pays $1.25 per hour in summer and $1.40 in winter for his own actual flying time.

Since delivery of their ship in May, 1939, it had been flown 615 hours without even a minor crackup by the end of the year, has been major overhauled and is kept in first-class condition at all times. They figure each member has flown approximately 50 hours at a cost to himself of $82.50, including his dues. The same amount of flying time at prevailing local rates would have cost him $300. This saving of $217.50 for each man has kept them in the air many more hours than they could have been without the club.

Flying time is apportioned among the members by a schedule arranged each month by the club flight supervisor, with dual and cross-country trips given preference. Members can trade flying time between themselves to suit their own convenience. C. A. A. rules are incorporated into the articles of the club. So satisfied are members of Cloud Club, Inc., that spring of this year will find them putting up $50 each toward the purchase of a new ship. In the near future they hope to have a ship with pontoons also, as the St. Paul airport has a seaplane dock on the Mississippi River which borders the field on two sides. With the more than 10,000 lakes for

(*Continued on page* 90)

★

# *Announcing*

the

# POPULAR AVIATION *DATA BOOK*

★

THE following pages mark the beginning of the only perpetually up-to-date directory in aviation. In contrast to other directories, the POPULAR AVIATION DATA BOOK is aimed primarily at the private flyer, the air-minded man-on-the-street, the man whose hobby is aviation and who flies for the fun of it. Additions to, or changes in this policy will be made as indicated by the majority of our readers. Subsequent issues of POPULAR AVIATION, probably every issue from now on, will contain additional data on airplanes as well as engines, radios, instruments and accessories. Suggestions for improvement of this service to our readers will be welcomed.

★

## AERONCA
*"Chief", 50F*

Aeronautical Corporation of America — Lunken Airport, Cincinnati, Ohio

## AERONCA
*"Chief", 65C*

Aeronautical Corporation of America — Lunken Airport, Cincinnati, Ohio

## BEECHCRAFT
*D17A*

Beech Aircraft Corporation — Wichita, Kansas

AIRCRAFT

## BEECHCRAFT
*D17R*

Beech Aircraft Corporation — Wichita, Kansas

## AERONCA "Chief", 65C

**COSTS:** List price: $1,795. Minimum down payment: $598.34. Annual insurance premium: $179.50. Operating cost per hour: $1.25.

**PERFORMANCE:** Miles per gallon of fuel: 20. Cruising speed at 75% horsepower: 95 m.p.h. Maximum speed at sea level: 105 m.p.h. Stalling speed: 35 m.p.h. Cruising range (excluding 10% fuel reserve): 200 miles. Service ceiling: 15,000 ft.

**SPECIFICATIONS:** T. C. No. 675. Type of airplane: CLM. Type of construction: wood, metal, fabric. Engine: 65 h.p. Continental A-65. Fuel capacity: 12 gals. Weight empty: 675 lbs. Weight loaded: 1,150 lbs. Span: 36 ft. Height: 6 ft. 3 in. Length: 21 ft. Wing area: 169 sq. ft. Wing loading: 6.8.

**ACCOMMODATION:** Number of seats: 2. Baggage: 40 lbs.

**EQUIPMENT:** Instruments (standard on this model): tachometer, oil temperature gauge, oil pressure gauge, altimeter, airspeed indicator.

Interior fittings: leatherette upholstery, carburetor heater, spinner, first aid kit, fire extinguisher, log books, engine manual, wings wired for navigation lights, dual controls, dual safety belt, carpet, primer and two doors.

Propeller: fixed pitch, wood.



## AERONCA "Chief", 50F

**COSTS:** List price: $1,565. Minimum down payment: $521.67. Annual insurance premium: $156.50. Operating cost per hour: $1.10.

**PERFORMANCE:** Miles per gallon of fuel: 24. Cruising speed at 75% horsepower: 88 m.p.h. Maximum speed at sea level: 97 m.p.h. Stalling speed: 35 m.p.h. Cruising range (excluding 10% fuel reserve): 240 miles. Service ceiling: 13,000 ft.

**SPECIFICATIONS:** T. C. No. 688. Type of airplane: CLM. Type of construction: wood, metal, fabric. Engine: 50 h.p. Franklin. Fuel capacity: 12 gals. Weight empty: 670 lbs. Weight loaded: 1,150 lbs. Span: 36 ft. Height: 6 ft. 3 in. Length: 21 ft. Wing area: 169 sq. ft. Wing loading: 6.8.

**ACCOMMODATION:** Number of seats: 2. Baggage: 40 lbs.

**EQUIPMENT:** Instruments (standard on this model): tachometer, oil temperature gauge, oil pressure gauge, altimeter, airspeed indicator.

Interior fittings: leatherette upholstery, carburetor heater, spinner, first aid kit, fire extinguisher, log books, engine manual, wings wired for navigation lights, dual controls, dual safety belt, carpet, primer and two doors.

Propeller: fixed pitch, wood.



## BEECHCRAFT D17R

**COSTS:** List price: $18,870. Minimum down payment: $7,548. Annual insurance premium: $1,839.82. Operating cost per hour: $18.45.

**PERFORMANCE:** Miles per gallon of fuel: 8.8. Cruising speed at 66% horsepower: 202 m.p.h. Maximum speed at 9,700 feet: 208 m.p.h. Stalling speed: 50 m.p.h. Cruising range (excluding 10% fuel reserve): 755 miles. Service ceiling: 23,000 ft.

**SPECIFICATIONS:** A. T. C. No. 638. Type of airplane: CLB. Type of construction: wood, metal, fabric. Engine: 450 h.p. Wright Whirlwind R975E3. Fuel capacity: 100 gals. Weight empty: 2,570 lbs. Weight loaded: 4,200 lbs. Span: 32 ft. Height: 8 ft. Length: 26 ft. 10.69 in. Wing area: 296.5 sq. ft. Wing loading: 14.17.

**ACCOMMODATION:** Number of seats: 5. Baggage: 125 lbs.

**EQUIPMENT:** Instruments (standard on this model): airspeed indicator, altimeter, turn and bank indicator, vertical speed indicator, compass, tachometer, engine gauge unit (oil pressure, oil temperature, fuel pressure), manifold pressure gauge, clock, head temperature gauge, ammeter, two Moonglow projector type instrument lights, tab position indicator (electric), electric gasoline gauge with selector switch, set of navigation lights, radio bonding and shielding.
Interior fittings: cabin heating and ventilating system, non-shatterable safety glass windshield and windows, cabin soundproofing, throw-over control column.
Propeller: Hamilton Standard, controllable pitch.

**SPECIAL FEATURES:** retractable landing gear and tail wheel (electrically operated, with auxiliary hand control), electrically operated trailing edge flaps on lower wings, negative wing stagger, full vision curved safety glass windshield, cantilever tail construction. Available as sea- or ski-plane.



## BEECHCRAFT D17A

**COSTS:** List price: $16,350. Minimum down payment: $6,540. Annual insurance premium: $1,594.12. Operating cost per hour: $15.49.

**PERFORMANCE:** Miles per gallon of fuel: 10. Cruising speed at 62½% horsepower: 170 m.p.h. Maximum speed at 9,600 feet: 185 m.p.h. Stalling speed: 50 m.p.h. Cruising range (excluding 10% fuel reserve): 735 miles. Service ceiling: 15,500 ft.

**SPECIFICATIONS:** A. T. C. No. 713. Type of airplane: CLB. Type of construction: wood, metal, fabric. Engine: 350 h.p. Wright Whirlwind R760E2. Fuel capacity: 98 gals. Weight empty: 2,465 lbs. Weight loaded: 4,200 lbs. Span: 32 ft. Height: 8 ft. Length: 26 ft. 7.8 in. Wing area: 296.5 sq. ft. Wing loading: 14.17.

**ACCOMMODATION:** Number of seats: 5. Baggage: 125 lbs.

**EQUIPMENT:** Instruments (standard on this model): airspeed indicator, altimeter, turn and bank indicator, vertical speed indicator, compass, tachometer, engine gauge unit (oil pressure, oil temperature, fuel pressure), manifold pressure gauge, clock, head temperature gauge, ammeter, two Moonglow projector type instrument lights, tab position indicator (electric), electric gasoline gauge with selector switch, set of navigation lights, radio bonding and shielding.
Interior fittings: cabin heating and ventilating system, non-shatterable safety glass windshield and windows, cabin soundproofing, throw-over control column.
Propeller: Hamilton Standard, controllable pitch.

**SPECIAL FEATURES:** retractable landing gear and tail wheel (electrically operated, with auxiliary hand control), electrically operated trailing edge flaps on lower wings, negative wing stagger, full-vision curved safety glass windshield, cantilever tail construction. Available as sea- or ski-plane.

## CESSNA

*Airmaster, C-145*

Cessna Aircraft Company — Wichita, Kansas

## FAIRCHILD

*24-R40*

Fairchild Aircraft — Hagerstown, Maryland

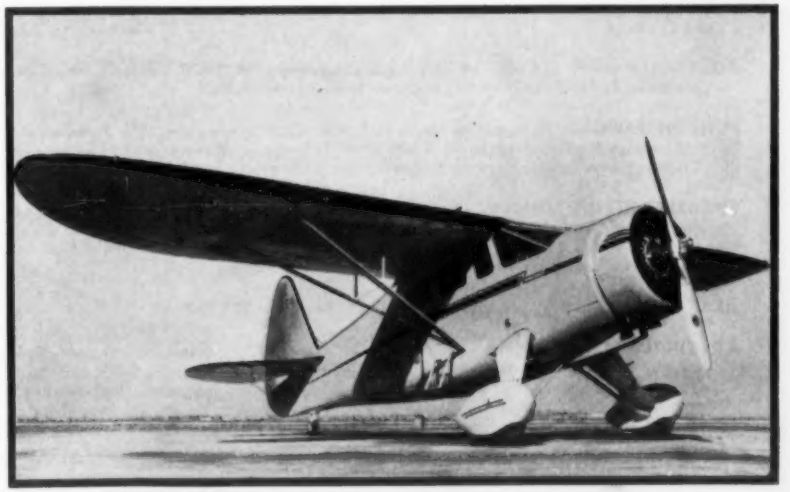
AIRCRAFT

## FUNK

*Model "75", B*

Akron Aircraft, Inc. — Akron Airport, Akron, Ohio

AIRCRAFT



## HOWARD

*DGA-15J*

Howard Aircraft Corporation — 5301 W. 65th St., Chicago, Illinois

## FAIRCHILD — 24-R40

**COSTS:** List price: $7,230. Minimum down payment: $2,407.59. Annual insurance premium: $704.92. Operating cost per hour: $10-$12.

**PERFORMANCE:** Miles per gallon of fuel: 11.7. Cruising speed at 75% horsepower: 130 m.p.h. Maximum speed at sea level: 135 m.p.h. Stalling speed: 50 m.p.h. (with flaps). Cruising range (excluding 10% fuel reserve): 450 miles. Service ceiling: 17,000 ft.

**SPECIFICATIONS:** A. T. C. No. 706. Type of airplane: CLM. Type of construction: metal, wood, fabric. Engine: 175 h.p. Ranger. Fuel capacity: 40 gals. Weight empty: 1,561 lbs. Weight loaded: 2,550 lbs. Span: 36 ft. 4 in. Height: 8 ft. Length: 24 ft. 10 in. Wing area: 174 sq. ft. Wing loading: 14.65.

**ACCOMMODATION:** Number of seats: 4. Baggage: 148 lbs.

**EQUIPMENT:** Instruments (standard on this model): compass, gas gauges, ammeter, usual flight panel, hydraulic brakes, steerable tail wheel, electric starter, ventilators, navigation lights, instrument lights, parking brake, engine driven generator.

Interior fittings: glove compartment, adjustable pilot seat, dome light, ash trays for front and rear seats.

Propeller: wood, fixed pitch.

**SPECIAL FEATURES:** Flaps, wheel pants.



## HOWARD — DGA-15J

**COSTS:** List price: $14,885. Minimum down payment: $4,956.70. Annual insurance premium: $1,488.50. Operating cost per hour: not available.

**PERFORMANCE:** Miles per gallon of fuel: 9.5. Cruising speed at 75% horsepower: 165 m.p.h. Maximum speed at 4,000 feet: 178 m.p.h. Stalling speed: 61 m.p.h. Cruising range (excluding 10% fuel reserve): 1,420 miles. Service ceiling: 15,500 ft.

**SPECIFICATIONS:** A. T. C. No. 717. Type of airplane: CLM. Type of construction: metal, wood, fabric. Engine: 300 h.p. Jacobs L-6MB. Fuel capacity: 150 gals. Weight empty: 2,500 lbs. Weight loaded: 4,350 lbs. Span: 38 ft. Height: 8 ft. 5 in. Length: 25 ft. Wing area: 210 sq. ft. Wing loading: 20.7.

**ACCOMMODATION:** Number of seats: 5. Baggage: 125 lbs.

**EQUIPMENT:** Instruments (standard on this model): altimeter, air temperature gauge, airspeed indicator, rate of climb indicator, compass, clock, bank and turn indicator, venturi and pitot, flap position and stabilizer indicator, thermocouple, manifold pressure gauge, fuel pressure gauge, oil pressure gauge, oil temperature gauge, tachometer, carburetor temperature gauge, fuel gauge, ammeter, fuel selector switch, inertia starter.

Propeller: Hamilton Standard, controllable pitch.

**SPECIAL FEATURES:** electrically-operated spring loaded flaps, tripod landing gear with oleo and springs for taxiing, full swiveling, steerable, locking tail wheel, stainless steel firewall in front of power section, pressure fire extinguisher.



## CESSNA — Airmaster, C-145

**COSTS:** List price: $6,790. Minimum down payment: $2,265. Annual insurance premium: $651.84. Operating cost per hour: $9.27.

**PERFORMANCE:** Miles per gallon of fuel: 15. Cruising speed at 75% horsepower: 151 m.p.h. Maximum speed at sea level: 162 m.p.h. Stalling speed: 49 m.p.h. Cruising range (excluding 10% fuel reserve): 472 miles. Service ceiling: 18,000 ft.

**SPECIFICATIONS:** A. T. C. No. 701. Type of airplane: CLM. Type of construction: metal, wood, fabric. Engine: 145 h.p. Warner Super-Scarab. Fuel capacity: 35 gals. Weight empty: 1,380 lbs. Weight loaded: 2,350 lbs. Span: 34 ft. 2 in. Height: 7 ft. length: 24 ft. 8 in. Wing area: 181 sq. ft. Wing loading: 13.

**ACCOMMODATION:** Number of seats: 4. Baggage: 64 lbs.

**EQUIPMENT:** Instruments (standard on this model): compass, altimeter, airspeed, tachometer, fuel gauge, oil pressure, oil temperature, ammeter.
Interior fittings: foam rubber cushions, indirect instrument lighting, ventilating system (heating optional), soundproofing.

Propeller: Curtiss-Reed, metal.

**SPECIAL FEATURES:** electric flaps, generator, navigation lights, shielding and bonding, locking swivel tail wheel, hydraulic brakes, dual controls, Plexiglas windshield. Also available as seaplane, skiplane, photo or ambulance plane.



## FUNK — Model "75", B

**COSTS:** List price: $1,950. Minimum down payment: $650. Annual insurance premium: $195. Operating cost per hour: $3.37.

**PERFORMANCE:** Miles per gallon of fuel: 25. Cruising speed at 75% horsepower: 100 m.p.h. Maximum speed at sea level: 112 m.p.h. Stalling speed: 39 m.p.h. Cruising range (excluding 10% fuel reserve): 360 miles. Service ceiling: 16,000 ft.

**SPECIFICATIONS:** Type Certificate No. 715. Type of airplane: CLM. Type of construction: metal, wood, fabric. Engine: 63 h.p. Funk Model E. Fuel capacity: 16 gals. Weight empty: 870 lbs. Weight loaded: 1,350 lbs. Span: 35 ft. Height: 6 ft. Length: 21 ft. Wing area: 168.9 sq. ft. Wing loading: 8.

**ACCOMMODATION:** Number of seats: 2. Baggage: 125 lbs.

**EQUIPMENT:** Instruments (standard on this model): tachometer, airspeed indicator, oil pressure gauge, gas gauge, temperature gauge, compass.

Interior fittings: glove compartment, Bungee control, adjustable windows, adjustable seat.

Propeller: wood, fixed pitch.

**SPECIAL FEATURES:** hydraulic landing gear, navigation lights, brakes, parking brakes, two doors, hot water heater, leatherette upholstery, aerial mast and fin attachment.

FAIRCHILD

COSTS: List price: $7230. Minimum down payment: $2,407.50.

24-R40

CESSNA

Airmaster, C-145

AIRCRAFT



PIPER
Cub Coupe, J-4

Piper Aircraft Corporation — Lock Haven, Pennsylvania

AIRCRAFT



PORTERFIELD
CP-65

Porterfield Aircraft Corporation — 2809 East 14th St., Kansas City, Mo.

AIRCRAFT



LUSCOMBE
8

Luscombe Airplane Corporation — West Trenton, New Jersey

AIRCRAFT



PIPER
Cub Cruiser, J-5

Piper Aircraft Corporation — Lock Haven, Pennsylvania

## PIPER — Cub Coupe, J-4

**COSTS:** List price: $1,995. Minimum down payment: $665. Annual insurance premium: $199.50. Operating cost per hour: $1.87, not including hangar storage.

**PERFORMANCE:** Miles per gallon of fuel: 21.1. Cruising speed at 2,150 r.p.m.: 97 miles. Maximum speed at sea level: 103 m.p.h. Stalling speed: 41 m.p.h. Cruising range (excluding 10% fuel reserve): 300+ miles. Service ceiling: 16,000 ft.

**SPECIFICATIONS:** A. T. C. No. 703. Type of airplane: CLM. Type of construction: wood, metal, fabric. Engine: 65 h.p. Continental or 65 h.p. Lycoming. Fuel capacity: 16-25 gals. Weight empty: 770 lbs. Weight loaded: 1,301 lbs. Span: 36 ft. 2 in. Height: 6 ft. 10 in. Length: 22 ft. 6 in. Wing area: 183 sq. ft. Wing loading: 7.12.

**ACCOMMODATION:** Number of seats: 2. Baggage: 105 lbs.

**EQUIPMENT** Instruments (standard on this model): oil pressure gauge, oil temperature gauge, tachometer, altimeter, airspeed indicator, compass.

Interior fittings: two-tone upholstery, two doors, glove compartment, parking brake, indirect instrument lighting, fuel gauge, 42 in. seat, floor mat, chromium plated sticks and pedals, panel convertible for blind flight, metal doors with locks.

Propeller: wood, fixed pitch.

**SPECIAL FEATURES:** Piper exhaust muffler, full pressure cowling, cabin and carburetor heater.



## PORTERFIELD — CP-65

**COSTS:** List price: $1,775. Minimum down payment: $591.67. Annual insurance premium: $266.25. Operating cost per hour: $2.46.

**PERFORMANCE:** Miles per gallon of fuel: 23.7. Cruising speed at 80% horsepower: 97 m.p.h. Maximum speed at sea level: 103 m.p.h. Stalling speed: 37 m.p.h. Cruising range (excluding 10% fuel reserve): 320 miles. Service ceiling: 18,000 ft.

**SPECIFICATIONS:** A. T. C. No. 720. Type of airplane: CLM. Type of construction: wood, metal, fabric. Engine: 65 h.p. Continental A-65. Fuel capacity: 13.5 gals. Weight empty: 670 lbs. Weight loaded: 1,160 lbs. Span: 34 ft. 9 in. Height: 7 ft. Length: 22 ft. 8 in. Wing area: 168.8 sq. ft. Wing loading: 6.87.

**ACCOMMODATION:** Number of seats: 2. Baggage: 40 lbs.

**EQUIPMENT:** Instruments (standard on this model): airspeed indicator, altimeter, tachometer, oil pressure gauge, oil temperature gauge.

Propeller: wood, fixed pitch.



## LUSCOMBE — 8

**COSTS:** List price: $1,895. Minimum down payment: $632. Annual insurance premium: $208.45. Operating cost per hour: $3.

**PERFORMANCE:** Miles per gallon of fuel: 26. Cruising speed at 75% horsepower: 96 m.p.h. Maximum speed at sea level: 109 m.p.h. Stalling speed: 37 m.p.h. Cruising range (excluding 10% fuel reserve): 360 miles. Service ceiling: 13,500 ft.

**SPECIFICATIONS:** A. T. C. No. 694. Type of airplane: CLM. Type of construction: all metal. Engine: 50 h.p. Continental A-50. Fuel capacity: 14 gals. Weight empty: 650 lbs. Weight loaded: 1,200 lbs. Span: 35 ft. Height: 5 ft. 10 in. Length: 20 ft. Wing area: 140 sq. ft. Wing loading: 8.6.

**ACCOMMODATION:** Number of seats: 2. Baggage: 55 lbs.

**EQUIPMENT:** Instruments (standard on this model): airspeed indicator, tachometer, oil pressure gauge, oil temperature gauge, altimeter, ignition switch.

Propeller: fixed pitch, wood.



## PIPER — Cub Cruiser, J-5

**COSTS:** List price: $1,798. Minimum down payment: $599. Annual insurance premium: $179.80. Operating cost per hour: $1.93.

**PERFORMANCE:** Miles per gallon of fuel: 20.01. Cruising speed at 2,350 r.p.m.: 93 m.p.h. Maximum speed at sea level: 101 m.p.h. Stalling speed: 39 m.p.h. Cruising range (excluding 10% fuel reserve): 343 miles. Service ceiling: 15,000 ft.

**SPECIFICATIONS:** A. T. C. granted, number not issued. Type of airplane: CLM. Type of construction: wood, metal, fabric. Engine: 75 h.p. Continental A-75 or 75 h.p. geared Lycoming. Fuel capacity: 19 gals. Weight empty: 750 lbs. Weight loaded: 1,450 lbs. Span: 35 ft. 5 in. Height: 6 ft. 10 in. Length: 22 ft. 6 in. Wing area: 179 sq. ft. Wing loading: 8.1.

**ACCOMMODATION:** Number of seats: 3. Baggage: 40 lbs.

**EQUIPMENT:** Instruments (standard on this model): oil pressure gauge, oil temperature gauge, tachometer, altimeter, airspeed indicator, compass.

Propeller: wood, fixed pitch.

**SPECIAL FEATURES:** Dual controls, dual hydraulic brakes, parking brake, navigation lights, full automobile-type door, wing tanks.

**PIPER** **Cub Coupe, J-4** **LUSCOMBE**

AIRCRAFT



## TAYLORCRAFT
*BL-50*

Taylorcraft Aviation Corporation — Alliance, Ohio

AIRCRAFT



## TAYLORCRAFT
*BL-65*

Taylorcraft Aviation Corporation — Alliance, Ohio

AIRCRAFT




## WACO
*Z. K. S.*

Waco Aircraft Company — Troy, Ohio

AIRCRAFT

### INSTRUCTIONS

DOWN PAYMENT on each airplane is quoted on the basis of the credit plan currently in use by the manufacturer of that particular ship.

ANNUAL INSURANCE PREMIUM includes full hull coverage based on 300 hours of pleasure flying annually unless otherwise noted. Average annual premium is 10 per cent of the plane's list price; unless the manufacturer has quoted some other specific premium, this 10 per cent figure has been used.

OPERATING COST PER HOUR includes normal maintenance and overhaul, depreciation and insurance and is based on 300 hours of flying annually unless otherwise noted.

PERFORMANCE figures are not guaranteed by Popular Aviation. They merely are listed as quoted by the manufacturer.

TYPE OF AIRPLANE is indicated by letters as follows. O: open. C: closed. M: monoplane. B: biplane. S: seaplane. Am: amphibian. L: landplane.

## TAYLORCRAFT — BL-65

**COSTS:** List price: $1,775. Minimum down payment: $650.83. Annual insurance premium: $177.50. Operating cost per hour: $2.41.

**PERFORMANCE:** Miles per gallon of fuel: 27. Cruising speed at 75% horsepower: 95 m.p.h. Maximum speed at sea level: 105 m.p.h. Stalling speed: 35 m.p.h. Cruising range (excluding 10% fuel reserve): 250 miles. Service ceiling: 17,000 ft.

**SPECIFICATIONS:** A. T. C. No. 700. Type of airplane: CLM. Type of construction: metal, wood, fabric. Engine: 65 h.p. Lycoming O-145-B1 or O-145-B2. Fuel capacity: 12 gals. Weight empty: 640 lbs. Weight loaded: 1,150 lbs. Span: 36 ft. Height: 6 ft. 8 in. Length: 22 ft. Wing area: 167 sq. ft. Wing loading: 6.88.

**ACCOMMODATION:** Number of seats: 2. Baggage: 30 lbs.

**EQUIPMENT:** Instruments (standard on this model): tachometer, oil pressure gauge, oil temperature gauge, airspeed indicator, altimeter, gas gauge.

Propeller: wood, fixed pitch.



POPULAR AVIATION, JUNE, 1940

## TAYLORCRAFT — BL-50

**COSTS:** List price: $1,660. Minimum down payment: $553.33. Annual insurance premium: $166. Operating cost per hour: $2.17.

**PERFORMANCE:** Miles per gallon of fuel: 27.7. Cruising speed at 75% horsepower: 88 m.p.h. Maximum speed at sea level: 97 m.p.h. Stalling speed: 35 m.p.h. Cruising range (excluding 10% fuel reserve): 250 miles. Service ceiling: 12,000 ft.

**SPECIFICATIONS:** A. T. C. No. 700. Type of airplane: CLM. Type of construction: metal, wood, fabric. Engine: 50 h.p. Lycoming O-145-A1 or 55 h.p. Lycoming O-145-A2. Fuel capacity: 12 gals. Weight empty: 632 lbs. Weight loaded: 1,150 lbs. Span: 36 ft. Height: 6 ft. 8 in. Length: 22 ft. Wing area: 167 sq. ft. Wing loading: 6.88.

**ACCOMMODATION:** Number of seats: 2. Baggage: 30 lbs.

**EQUIPMENT:** Instruments (standard on this model): tachometer, oil pressure gauge, oil temperature gauge, airspeed indicator, altimeter, gas gauge.

Propeller: wood, fixed pitch.

POPULAR AVIATION, JUNE, 1940

## WACO — Z. K. S.

**COSTS:** List price: $7,890. Minimum down payment: $2,627.37. Annual insurance premium: $769.27. Operating cost per hour: not available.

**PERFORMANCE:** Miles per gallon of fuel: 10. Cruising speed at 70% horsepower: 144 m.p.h. Maximum speed at sea level: 152 m.p.h. Stalling speed: 55 m.p.h. Cruising range (excluding 15% fuel reserve): 504 miles. Service ceiling: 14,000 ft.

**SPECIFICATIONS:** A. T. C. No. 626. Type of airplane: CLM. Type of construction: metal, wood, fabric. Engine: 285 h.p. Jacobs L5. Fuel capacity: 70 gals. Weight empty: 1,981 lbs. Weight loaded: 3,250 lbs. Span: 33 ft. 3 in. Height: 8 ft. 4 in. Length: 25 ft. 4 in. Wing area: 244 sq. ft. Wing loading: 13.32.

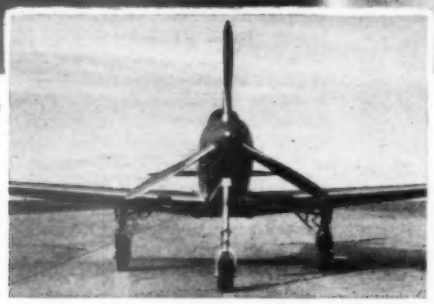
**ACCOMMODATION:** Number of seats: 5. Baggage: 100 lbs.

**EQUIPMENT:** Instruments (standard on this model): altimeter, airspeed indicator, compass, electric fuel gauges, oil pressure gauge, oil temperature gauge, tachometer, volt ammeter, electric starter, 15 ampere generator, navigation lights, indirectly lighted instrument panel with rheostat control.

Interior fittings: Fabricoid trim, adjustable front seats, ash trays, hydraulic brakes, parking brake, dual rudder pedals, throw-over control wheel, fire extinguisher, tie down ropes.

Propeller: Curtiss-Reed, metal.

The P-39 is completely flush-riveted, all rivet heads being covered with a filler.



Its tricycle gear reduces hazards of landing the P-39. Below is tester on which gear was given hours of punishment before installation.

# Killer

CONSERVATIVELY speaking the Bell XP-39 (*Airacobra)* has a cruising speed of slightly over 400 m.p.h. This fact has been given widespread publicity. But persons seeking performance data should not be misled by flat statements concerning a new fighter's "terrific performance" until checking further. What makes the *Airacobra* so deadly, in addition to its 400 m.p.h., is its heavy armament (one cannon, four machine guns), its 1,000-mile range and its ability to operate efficiently at 36,000 feet. While Britain and France seek the release of this fighter, the U. S. Army Air Corps is conducting tests on the ship shown on this page. Its 1,200 h.p. Allison engine is directly behind the pilot; the propeller is on an extended drive shaft. The ship's span is 34 feet; length is 29 ft. 9 in. The tricycle gear retracts, landing speed is approximately 68 m.p.h., wing loading is 28.3. Several are in production for the U. S. Army and Navy.

More than 500 hours of tests have been given engine and shaft. Note radiator.

TAYLORCRAFT
COSTS: List price: $1,775. Minimum down payment $450.00
BL-65
TAYLORCRAFT
BL-50

AIRCRAFT OWNERS AND PILOTS ASSOCIATION

# AOPA NEWS

WE have had another one of those frequent aviation administration turnovers in Washington since last time AOPA reported to its membership. This one, although accompanied by some preaction rumblings that were apparent to a few of us who had our ears close to the ground, came more or less as a complete surprise to the country and to pilots at large. Therefore, we believe it is important to pass on in some detail the proposed changes.

The executive order of President Roosevelt under what he has called "Reorganization Plan IV" makes the following changes in the aviation picture:

1. The Civil Aeronautics Authority and its function; the administrator of civil aeronautics and his functions; and the functions of the Air Safety Board are transferred to the Department of Commerce. The C. A. A. has its name changed to the *Civil Aeronautics Board.*

2. The offices of the members of the Air Safety Board are abolished. The functions of the board are consolidated with those of the Civil Aeronautics Board. The board shall provide for independent investigation of aircraft accidents.

3. The administrator who hitherto has been reporting directly to the President now reports to him and to Congress through the Secretary of Commerce. All budgeting, accounting, personnel procurement and related routine management is under the direction and supervision of the secretary of commerce.

4. The board shall continue to exercise its function of rule making, adjudication and investigation independent of the Secretary of Commerce.

5. The weather bureau in the Department of Agriculture and its functions are transferred to the Department of Commerce and shall be administered by the Secretary of Commerce.

At this writing it is perhaps too early to evaluate the results of this change. It is probably on the credit side that the weather bureau has been consolidated with the civil air board. It definitely seems on the debit side that the Air Safety Board has been abolished. It would also seem likely that this change may toss civil aviation administration back to the political wolves that toyed with it in years past.

The commercial airline operators, seeing that the air board members still are independent in their making of rates, rules, and standards, profess to be unconcerned. The private pilot, however, seems to be back at the same place he occupied in the period prior to the creation of the C. A. A. We cannot yet tell what the change will mean to the private flying section—none, we hope.

One last word. The proposed executive order can be and may be upset by congress. Signs of revolt already are visible in congress. A three-quarters vote in both houses would nullify the order. Senator Pat McCarren, aviation's good friend, is leading a fight to preserve the status as created under the Civil Aeronautics Act.

Developments in this fight and in the settlement of the seemingly conflicting issues raised by the president's proposal will be worth watching closely. They will vitally affect all AOPA members. We do not believe that there will be any immediate effect among the C. A. A.'s excellent field personnel.

* * *

We want to make a personal report on our circle tour of flying fields, factories and of visits to flying friends that still is in progress at this moment. But before getting into this let us thank you all for the steady flow of most constructive suggestions and letters your AOPA officers have been receiving from the membership.

Our greatest battle now is to get the national airport program rolling. There is a lot of sound thinking on this subject among AOPA channels, and it is generally recognized that the great barrier is that of obtaining sufficient numbers of landing fields. *And we don't mean a half dozen super colossal gold-plated, fee-infested terminals.*

Let us add that AOPA believes that the National Aviation Forum set for May 27 through 30th in Washington will be a logical place to get this airport situation ironed out. Tom Beck, a friend of all pilots, is running the show and promises it will surpass anything ever held in air history. South American countries are sending delegates and AOPA has been invited to help arrange the forum and to have representatives on the program. Watch for newspaper accounts of the forum.

We left Newark airport on March 24, heading for Seattle via Salt Lake and Boise, Idaho, to commence our tour. First order of business was 12 hours of sleep. When we crawled out of our berth—that's an editorial we—the airliner was slipping down through Immigration Pass and ahead lay the Great Salt Lake.

Leaving Salt Lake City airport with breakfast under our belt, we sit and ruminate as the lake, then the hills of the Blue Mountains unroll beneath us. We're over the Oregon Trail. Ahead lies Boise with its 8,700 foot runway. Just about the longest in the world. There is lots of private flying around Boise. Cy Thompson of United Airlines organized the first aero club there about 20 years ago.

The next stop is Pendleton. We recommend that you cross country fiends fly out to Frontier Days at Cheyenne or on to the rodeo at Pendleton. You'll feel like sissies after you watch the cow-hands and their ponies work the steers. Just ahead here are real mountains, Baker, St. Helens and Mount Hood. Below is the Columbia Gorge with its wind-tunnel effect. In the old days everyone flew through the gorge. It was about like taking a railroad train through a tunnel. But no longer. Up to 12,000 feet above sea level now. This is the finest country in the world for private flying. The only really tough stretches from Cleveland to Portland are over the hump from Cheyenne to Salt Lake.

The easterner gets the idea this is tough country, but as a matter of fact the valleys are broad and beautiful, the visibility is unparalleled.

Stopped to have lunch with AOPA sponsor Harry Coffey at Portland. He has a twin-engined Beech and is a really great pilot. He's also president of the Aero Club of Portland. They own their own eight story clubhouse with swimming pool, gymnasium, multiple dining rooms and all the comforts. And it's debt free. Why aren't there clubs like it elsewhere?

(*Continued on page* 91)

**Three girls prominent in aviation are (left to right) Dorothy Fulton of Teaneck, N. J., Barbara Kibbee of Delmar, N. Y., daughter of Movie Actor Guy Kibbee and AOPA member No. 972; and 16-year-old Mary Grove, youngest soloed pilot in Kentucky.**

# AIRCRAFT WITH ROTARY WINGS

by RAOUL J. HOFFMAN

CONSIDERABLE effort has been made to develop airplanes with rotary wings in order to obtain vertical take-off. A vertical take-off also will enable hovering or standing still in the air at will and reduce the necessary airport to the size of a backyard.

Many designs have been tried; airplanes with wings rotating about a lateral axis as sketched in Section 1; airplanes with wings rotating about a longitudinal axis as outlined in the lower sketch in Section 1; airplanes with wings or blades rotating about a vertical axis as illusrated in Section 2. Only airplanes having a vertical rotor axis have been successful.

Rotating wings may be free-wheeled by an airstream if they are set at a certain angle and given an initial motion. In addition, a propeller driven by a motor may supply the necessary thrust required to carry a load if the axis is set at a certain angle.

Another method to take-off with rotary-wing airplanes is to drive the blades or vanes with an engine. The wings do not have to possess the ability of self-rotation or auto-gyration except in case of an engine failure. Some designers even suggest to combine motor driven vanes with a propeller for forward flight.

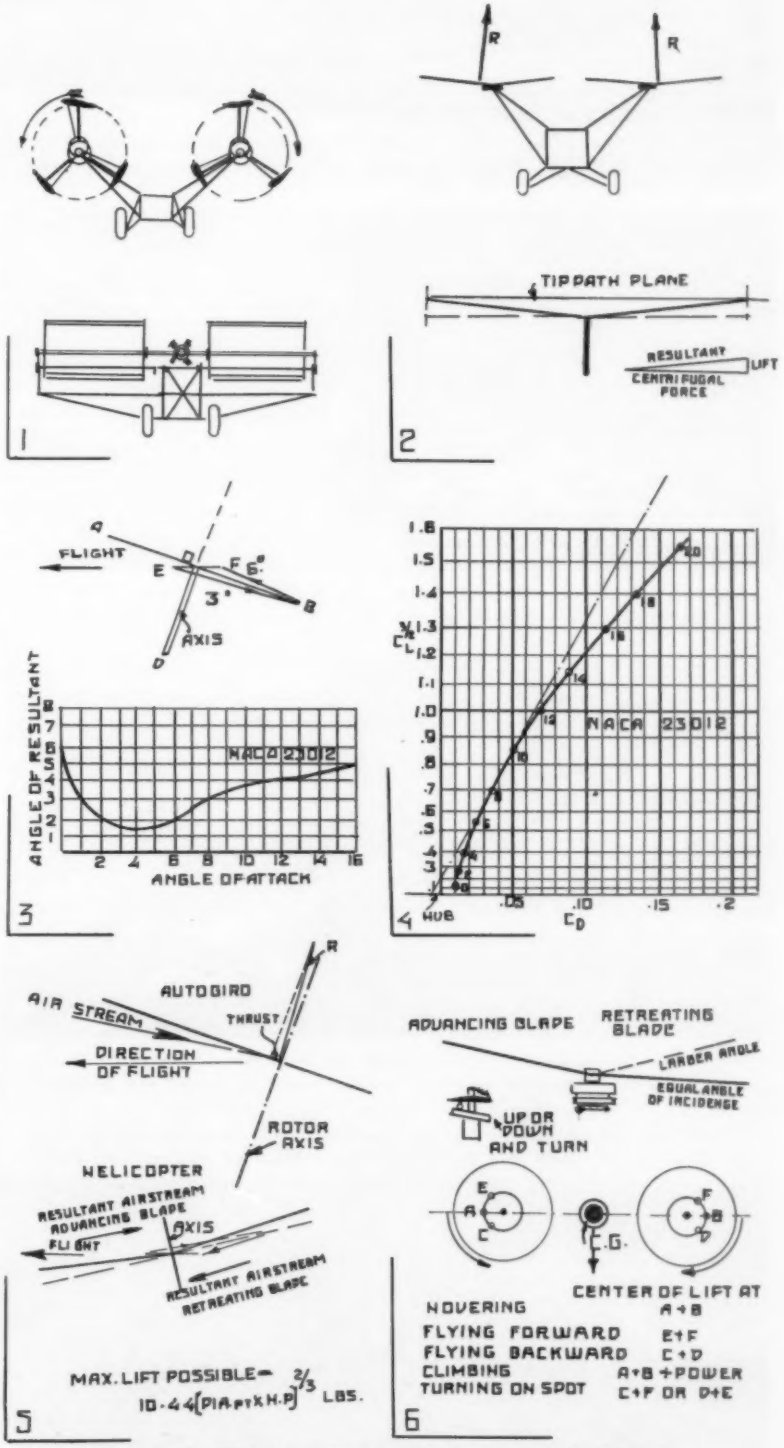
Blades rotating about a lateral or longitudinal axis cannot create lift on the down or up-stroke; this condition seems to make them less efficient than the ones rotating about a vertical axis that are without intermittent loss of lift.

Blades rotating on a vertical axis may be hinged freely to the rotor head to eliminate bending moment. Centrifugal force and the lifting force will keep the blade at a certain angle as sketched in Section 2. This angle is called the coning angle and varies from zero to nine degrees if no down load is present. The angle should not exceed 10° in order to prevent loss of efficiency. In some designs the centrifugal force is as high as 6,000 pounds.

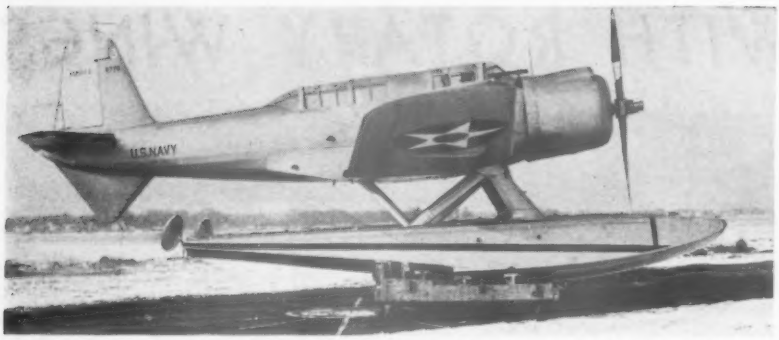
For simplicity in the following investigations the coning angle will be assumed to be zero. A vector diagram of a rotor with its axis tilted backward is shown in Section 3. A-B denotes the rotor plane, O-D the axis of the rotor. E-O and O-F the flying speed and O-B the tip speed. The resultant air speed for the advancing blade located lateral to the point O is E-B at an angle of three degrees with the rotor plane. The resultant of the retreating blade opposite the advancing blade is B-F at an angle of five degrees with the rotor plane. In this specific case the flying speed is 26 per cent of the tip speed. The relative air speed for the advancing blade is 25 per cent higher than the tip speed and for the retreating blade 24 per cent lower.

A diagram in Section 3 has the angle of the resultant with the vertical to the

(*Continued on page* 95)




**These sketches illustrate points referred to by the author in his article.**

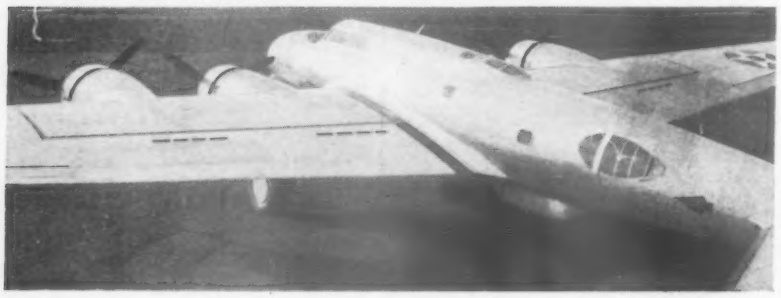



Now in production for the U. S. Navy is this float-equipped Vought-Sikorsky SB2U-3. A ship similar to this already is being used on land and aboard carriers by the Navy.

Reported to be already released for export is this Grumman XF5F-1 fighter. Two 1,200 h.p. engines give it a top speed well over 425 m.p.h. It climbs 60 m.p.h. vertically.

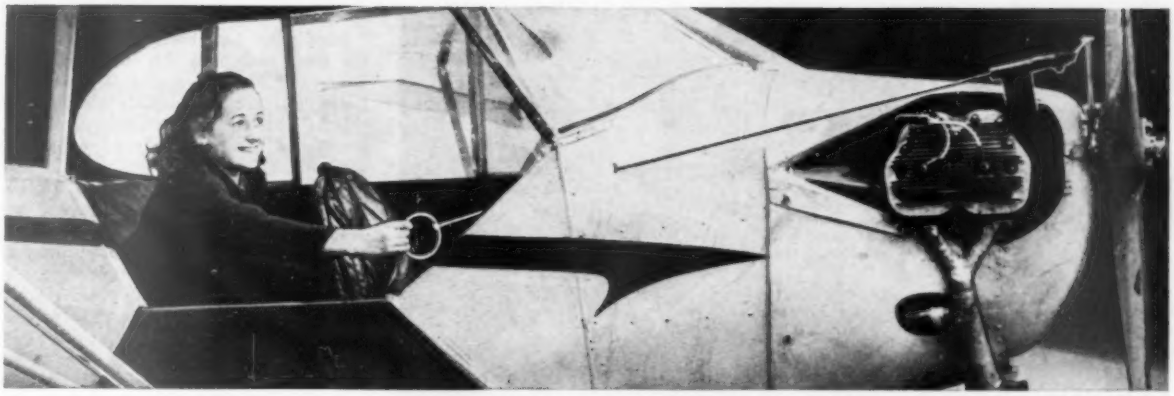
This German Heinkel He-111K bomber recently was shot down and captured practically intact by British. They have repaired it and are conducting ground and flight tests.

Wright Field engineers, conducting experiments with armanent on the basis of results in Europe, have rigged this B-17B with special flush-type machine gun blisters.



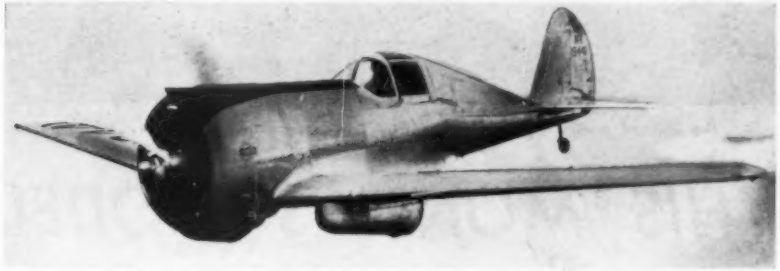
A new engine timer is this device which fits on propeller hub and marks pitch.

That Uncle Sam is toying with the balloon barrage idea is evidenced by this picture made recently not far from Akron, Ohio.



This novel lightplane engine starter, developed in Pittsburgh, soon will go on the market. The pilot spins the motor from his seat by pulling handle, operating ratchet device behind propeller.

# HAVE YOU SEEN ?

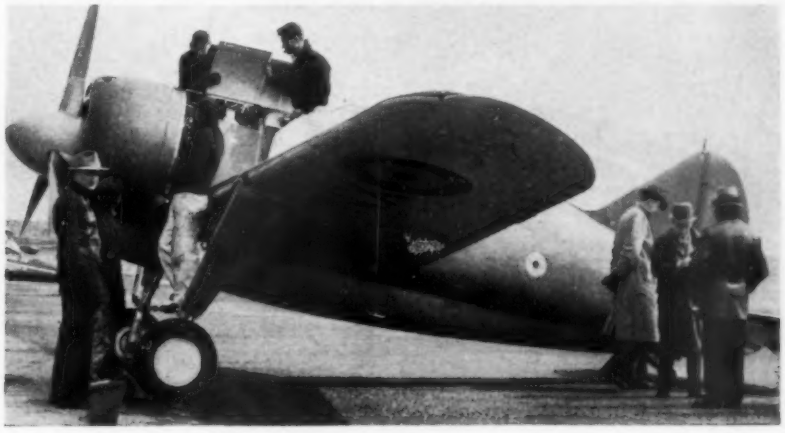


Now in production for one of the Allies is this Curtiss-Wright interceptor-fighter. Powered with a 1,000 h.p. engine, the ship has four guns, has fastest rated climb.

Above is novel flying scale model of new British Saro patrol boat. Built in preference to wind tunnel models, the midget is powered with four 90 h.p. engines.

Edgar J. Kain (left) is leading Allied ace, is 22, has shot down five bombers.

The chunky Brewster F2A-1 fighter below was being prepared for shipment to Belgium. Other Brewster buyers are Finland, Britain and the U. S. Navy. Speed is over 300 m.p.h.



The finished model is a trim, stable flyer. Note cantilever construction of tail.

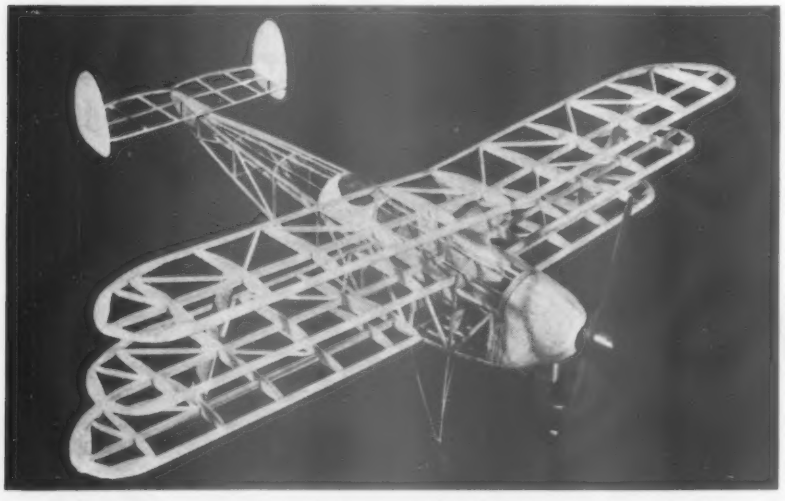
# THIS MONTH'S MODEL

by PAUL W. LINDBERG

Model Editor and Designer

**Two unusual angles are worked into this gas model: twin rudders and three wings. An interesting ship.**

THIS month's article deals with a gas-powered model of unusual design. Triplanes are something rare in gas models, especially with twin rudders. We were anxious to try this type of model out so we could determine just what the characteristics of such a model would be. To our amazement, we found it to be an exceptionally good flyer due to its great amount of wing area. The short span which is only 29½ inches, makes it an easy model to carry from place to place. It can be powered with any 1/7 h.p. or smaller motor. By enlarging the plan four times the size shown, an exact duplicate will be had of the model that we constructed. Enlarging may be done with an ordinary pair of draftsman's dividers.



Conventional construction is used throughout. The three wings are of equal length.

### Construction of Fuselage

Simplicity has been incorporated in the construction of this fuselage. Main longerons can be made of spruce or basswood. All intermediate struts are of balsa. The top of the fuselage is constructed with a simple curved section and turtle back.

The motor mount and firewall are one unit. We suggest that you select a very hard wood for the motor mount beams. Please note: the whole assembly may be removed at will for the replacement of new parts. After carefully studying the plan, you will find it very easy to construct.

The motor cowl is carved from a soft grade of balsa, as this cowl is intended for appearance only. It may be attached to the firewall, although model will fly equally well with or without the cowl.

### Landing Gear

The landing gear is so simple to construct that there is little to be said of its construction. We might add that all connections between body and landing gear be wrapped with heavy thread and cement. At lower junction of landing gear, bind with fine wire and solder.

### Wings and Tail Assembly

Construct the wings upon a flat surface, so as to obtain perfect alignment throughout construction. The panel is cemented together at root ribs with approximately 3° dihedral. The middle and lower panels are left separate as they are attached to the body after they have first been covered. The tail assembly is of unusual and clean construction. Note: the rudders are made from ⅛ inch sheet of balsa medium weight.

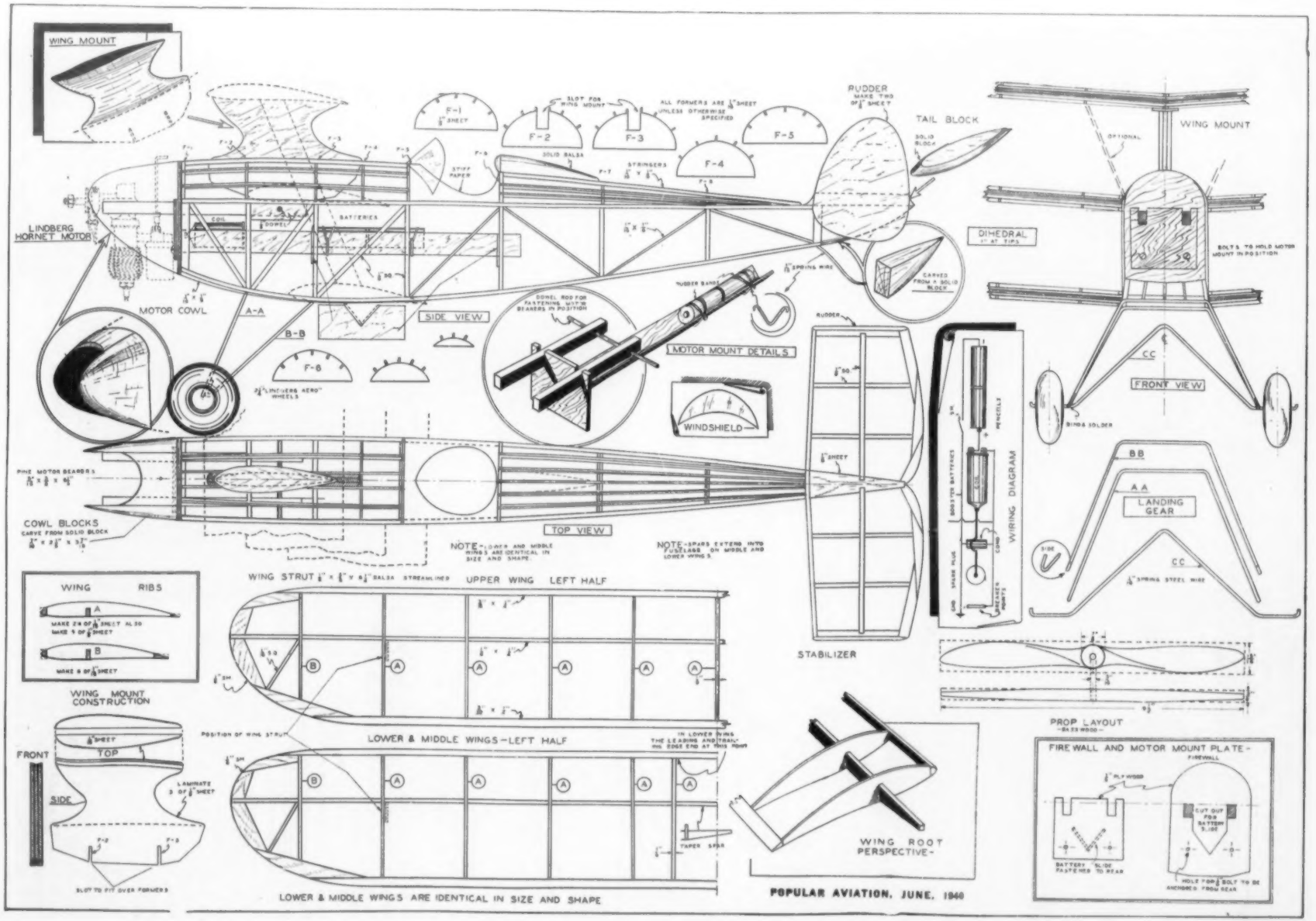
### Covering the Model

The model may be covered with lightweight bamboo paper or Japanese tissue. Cover all parts separately and assemble after they are completely finished. Heavy model airplane dope makes an excellent adhesive to attach the paper to the framework. In order to make the paper drum-tight, apply a coat of water over the entire surface with an atomizer or a cheap type of spray gun. Pin the wings and elevator to a flat surface and allow the water to evaporate from them before removing, as this will prevent warping. Two to three coats of ordinary model airplane dope are necessary to keep them taut. Color coats now may be added.

### Assembly

Check the plan carefully on assembling, as all parts should be lined up perfectly for best results. Trimmings such as shown in the photo are had by cutting strips of paper and doping them to the finished model. Any designs may be added to suit your taste. Properly balance your model by gliding before flying it under power. An aluminum tab may be added to the trailing edge of upper left wing panel (size: 1x3 inches). This will help correct any torque from the propeller. This tab may not be necessary, but it is worth adding to model. Note: take especial care in testing and launching this model.

END




POPULAR AVIATION, JUNE, 1940

## There's Grief in Them Thar Hills

(*Continued from page* 17)

I assisted the pilot and passenger to shore. Fortunately they were not seriously injured. Had they struck the ground I'm afraid they would not have fared so well.

Such incidents are always occurring everywhere. Last summer I demonstrated the effect of wind currents on flying to my 17-year-old son, Dale. We took a 50 h.p. lightplane and climbed to 1,500 feet above the airport at The Dalles, Ore. A strong southwest wind was blowing. About five miles west of the airport a mountain rises to more than 2,000 feet above the Columbia river Valley, lying in a northwest to southwest direction. The wind was flowing directly across it. Across the Columbia river on the Washington side another long ridge rises to 4,000 feet. These ridges are perhaps five miles apart. Under the same conditions in this same location 20 years before violent down-drafts had brought me close to an accident.

After reaching 1,500 feet I told Dale to approach the mountain on the Oregon side at about a 30° angle so that he would not have to make a sharp turn to get away from it when we struck the down-drafts. When we came to within 1,000 feet of the ridge we began to hit the down-drafts and we opened up the little engine. At first we climbed 200 feet a minute. Then we struck some bad ones and we began settling very fast in spite of the fact that we had the engine wide open and were in a position of maximum climb. After we had settled 500 feet we turned slightly to the north with the nose well down and headed out across the river toward the ridge on the Washington side, where he knew there would be strong up-drafts.

As we came within 1,000 feet of the side of the windward ridge our ship began to climb far in excess of its normal rate. We began throttling back and the ship continued to climb. Finally we pulled the throttle back to idling position and the ship still went up, much the same as a glider. A test of this kind will demonstrate clearly what a pilot has to face in mountainous regions when the wind is blowing.

In 1930, while flying students cross-country on navigation instruction for limited commercial licenses, I had an experience with down-drafts which is still the most harrowing in my memory. It was my practice while operating my school in Portland, Ore., to take all limited commercial and transport students on such cruises flying either a six-place Stinson with a Wright J6-9 engine or a Ryan B1 with a J-5 engine. While one student sat at the controls the others worked wind drift problems and learned to read maps. On this occasion we had the Ryan. We had flown down the west side of the Cascades and Sierras from Portland to Los Angeles with stops at Medford and Sacramento. On the return trip we always flew along the east side of these ranges in order to present new terrain and new problems throughout the trip.

A serious storm had followed us down the coast and overnight had closed in the Sacramento and San Joaquin valleys as well as the San Francisco bay region. The next morning we could obtain no reports of winds aloft anywhere along the Pacific Coast. Even Los Angeles was "socked in" solidly, but offered a ceiling of 2,000 feet. Reno and Bishop reported more than 10 miles' visibility, high ceilings and light surface wind. Palmdale, on the Mojave desert, had high, broken clouds.

We decided to take off and climb through the overcast at Los Angeles. This done, we headed for Reno with Bishop as an alternate airport in case of headwinds. We broke into bright sunshine at 7,000 feet and established a course for Bishop, which lies in the Owens Valley along the east side of the high Sierras. In the ship were three students who had been sent down to my school for a refresher course by the Consolidated Mining and Smelting Company of British Columbia. Two were Canadian and one British. All had flown in the Royal Air Force but had discontinued flying after being mustered out. Eric Gunner, the British student, was at the controls.

About 45 minutes after we had come through the overcast we were over Mojave at 9,000 feet with broken clouds below us. At this point we noticed a slight drift from the west, our first indication of a west wind aloft. We made necessary corrections and continued to climb. As we passed over Owens Lake at an altitude of 14,000 we observed that the air was becoming moderately rough. The drift increased a few degrees, indicating the west wind was increasing in velocity.

"Hello, Cleveland? How high did you say those mountains were between Pittsburgh and Bubbling Springs . . . ?"

We now were practically level with Mt. Langley and Mt. Bernard but about 500 feet lower than Mt. Whitney's summit, the peaks lying only to or three miles to our left. They are the highest group of mountains in the United States. More than 10,000 feet below us lay the narrow Owens Valley, approximately five miles wide at this point. With the snow-covered summit of the high Sierras rising two miles above the floor of the valley on the west side and the Inyo range on the east side rising many thousands of feet into the skies, the valley looked like a colossal canal beneath us.

As we neared Independence, the bottom seemed to drop out of everything without any warning whatsoever. Loose baggage, coats, books, thermos bottles and other articles went to the ceiling and stuck there as if glued. My first thought was that the wings had left us. I checked this instantly and observed with much satisfaction that they were still there. In some manner I changed seats with Gunner. This was a bit difficult, for we both seemed to float around in the cabin when we removed our safety belts. Gunner and the other chap, who had been sharing the middle seat with me, assisted me in fastening my safety belt in the pilot's seat and I went to work in all seriousness to stop the rapid descent of the ship. I never had encountered anything of this sort before and I did not at first realize we were being carried toward the earth by a phenomenal down-draft.

The uncanny descent continued. The engine had stopped running when the first shock of the down-draft was felt, probably because the ship was falling faster than the gas could run down the lines from the tanks. The gasoline itself was undoubtedly pushed up against the top of the tanks, just as the loose articles were held against the ceiling of the cabin. The propeller continued to rotate, however, and this fact convinced me afterward that the ship *did* have considerable forward speed, although at the moment I felt that we were going straight downward with no forward speed at all.

There was no panic on the part of anyone. We were naturally very much worried because it looked like a very serious situation. But I don't think that any of us considered it would end fatally. There was nothing to do but to try to get the nose down into a dive, which for a while seemed impossible. I felt that the ship was near the stalling speed (I never did look at the air speed indicator, mainly because I was too busy) and I was worried about the possibility of a spin.

After we had fallen about 9,000 feet,

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during which the controls seemed sloppy and ineffective, I observed an interesting phenomenon below. Dust was beginning to spread out in all directions beneath us. This proved to me instantly that a gigantic down-draft was blowing directly onto the floor of the valley. The elevation of the valley floor at this point is about 3,000 feet. We were now within 1,000 feet of it. At this moment I observed (with much relief) that the tail was coming up, that the controls were beginning to come to life, that the engine was beginning to fire intermittently and that the rate of descent was decreasing considerably. Apparently we were beginning to feel the effect of the so-called "ground cushion". That is, the ground was slowing the velocity of the down-draft as it approached the surface.

At about 500 feet the engine began to run steadily. The ship was in a dive of about 45°. I remember glancing at the air speed and finding that it read about 150 m.p.h. My plan was to get fairly close to the ground in this dive, then level off at about 50 feet and try to hold that altitude if possible. If not, I would try to fly the ship onto the ground in a two-point landing, cut the ignition and just hope for the best.

As I approached the surface and began to level I was greatly relieved to find that the ship would hold its altitude of 50 or 60 feet, although it would not climb. Now that we knew we had been brought down by a down-draft, I figured there must be some up-drafts to our right along the Inyo range two or three miles east. The air was extremely rough and control of the ship none too good. But I turned slightly to the right and flew towards the Inyos. As we neared their base we began to climb slightly, just enough to remain about 100 feet above the sloping surface. As we began to reach the higher slopes of the mountain range our rate of climb increased noticeably. We remained close to the mountains, seldom being more than 300 feet away from their slopes. Soon we topped the summit and continued on up to 15,000 feet before we leveled off.

Then we re-established a course for Reno. One of the students took over the controls and we stayed away from the high Sierras during the rest of the hop, for none relished any repetition of that experience. However, I believe that all of us were mighty glad that we had been able to observe this unusual incident first-handed, for we learned quite a bit from our experience—*principally to stay away from the leeward side of mountain ranges when the wind is blowing.*

Later, none of us was able to estimate with any degree of certainty just how many seconds passed while we were falling 10,000 feet. It seemed like hours at the time, but it couldn't have been more than a minute and a half or two minutes. We also decided that probably the volume of air in the down-draft was relatively heavy because it had been cooled to below-zero temperatures by the mountain snows. This additional weight caused it to fall faster than it would have ordinarily.

*The following note was attached to this article by Tex Rankin when it reached the editor's desk:*

*"Since I have been writing this series of articles for* POPULAR AVIATION *I have received hundreds of letters from potential flying students wanting to 'come to California and attend my flying school.' Evidently many people are still under the impression that I still am in the flying school business. The assumption is not correct. I have retired from the ownership or operation of a flying school. Nor do I give acrobatic instruction commercially. My only desire in writing these articles is to pass my experiences on to younger pilots in the hope that they may prove of benefit. I am doing only what I would expect any other pilot to do for my own sons and daughters.*

*T. R."*

In 1936 I had another interesting experience with a violent down-draft. This time, however, I did not have that uncanny feeling of helplessness that had gripped me before. I knew what to expect. I realized that a structural failure had not occurred.

I was bringing a four-place cabin job from the east to California, accompanied by a friend, Dr. Boldridge, of Charlotte, N. C., who had met me at Cincinnati. The first part of the trip passed without incident. However, when we landed at Amarillo, Tex., the surface wind was 35 m.p.h. and we were advised we'd encounter dust storms westward. We were debating about staying at Amarillo when we got a report that the surface wind at Albuquerque was only 20 m.p.h. so we took-off.

As we neared the Texas-New Mexico boundary line we encountered a very severe dust storm. We at first attempted to fly close to the ground because of poor visibility but we were forced to go on instruments and climb up through the black clouds of dust. For some time we could see neither ground nor sky and it was as dark, as night. The air was extremely rough and we took only a slight rate of climb in order to maintain as much speed as possible. We were not so much interested in making headway, but we wanted the speed so that we could more easily control the ship in rough air.

Finally we broke through the dust clouds and emerged into bright sunshine. Beneath us a great dark brown cloud extended in all directions. We established a compass course for Albuquerque, allowing a 25° drift for the strong wind coming out of the southwest. After flying over the dust storm for half an hour we came out over open country and everything ahead looked clear. We had left the flat plains of the Texas panhandle behind and were now over the buttes, ledges and ridges in eastern New Mexico which herald the mountainous terrain of the west.

Just as we throttled to cruising speed and relaxed at an altitude of 9,000 feet above sea level, the ship suddenly struck a terrific down-draft. We were about 5,000 feet above the surface at this point, which is approximately 4,000 feet above sea level. As before, everything not tied down rose to the ceiling and the engine quit. Dr. Boldridge had been flying since the Amarillo take-off. This was his first experience with a violent down-draft but he did a mighty nice job of handling the ship, getting the nose down and keeping the wings level. After we had dropped about 3,000 feet we began to slow up in our rate of descent. Perhaps the ground cushion had some effect on the ship, but this is doubtful as we were still 2,000 feet above the surface. The engine came in at this point and the doctor started to climb with wide-open throttle and the nose as high as he dared pull it, but the ship kept sinking at the rate of 500 feet per minute. Two minutes later conditions were still unchanged and we were only 1,000 feet above the ground. I suggested that we ought to put the nose down, get some additional speed and turn back. The doctor did this. We were now only three or four hundred feet above the ground and flying down wind toward the storm. But we were able to hold our altitude. As we approached the storm we began our climb and continued on up to 12,000 feet before we turned back on our course toward Albuquerque. We had no further difficulty.

In summing up, I would say that every beginning pilot and those who have flown in flat country who are anticipating flying in the far west give considerable study to wind currents. Once a pilot is aware of what is going on under such conditions he is far better prepared to meet them than one who is thrown into bewildered panic.

END

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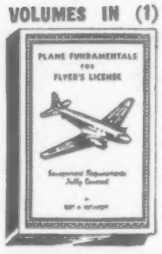


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## Mystery Airfoil

(*Continued from page 37*)

tem. This group's engineers developed a series of streamlines. These in turn were bent around different-shaped curves or "mean camber lines", thus creating a system of foils. In this general manner related series of foil shapes were developed, tested and the characteristics listed. By analyzing the "bent" streamlines, performance could be quite accurately foretold.

With airfoils stretching almost to infinity and millions spent in all parts of the world on their development, the engineers agreed that they had reached the acme of wing perfection—90 per cent efficiency, with the 10 per cent loss accounted for by skin friction. Meanwhile, working quietly with his revolutionary conception for more than a decade, David R. Davis threw overboard the time-honored approach to airfoils.

A curve, he saw, was the product of mechanical action—rotation at infinite speed. "A circle," he said, "is not an inert object. It is something going around—a radius arm (or lever arm) rotating about a center."

Having stumbled on this hypothesis, he discovered that the most efficient mechanical action to produce lift would result from the proper relation between the rotational speed of the radius arm and the translational velocity of the point about which the radius arm rotates.

Sounds pretty deep, doesn't it? Actually, it's quite simple. Two factors must be borne in mind when considering the Davis airfoil. One is rotation—*movement* of the radius arm around the center of a circle. The other is translation—*movement* of the center itself. You can reproduce part of a Davis airfoil—not *the* mystery Davis airfoil, of course—as follows:

Mark a dot on a sheet of paper, designating it as the center of a circle. Place the point of a pencil on that dot, then lay the pencil down to form a radius, or lever, arm. Now turn the pencil clockwise and, at the same time, move the point in a straight line to the left (thus indicating movement of the circle's center by the latter motion). The curve formed by the top of the pencil as result of this simultaneous action is fundamentally part of a Davis airfoil profile—the product of two *steady movements.*

Steadiness is important. "If you rotate a flywheel steadily it takes less effort to keep it moving," Davis explained. "If done jerkily, more horsepower will be required. The same is true of translation. The center of the circle must move at a steady rate. The combined steady actions will trace the top curve of an airfoil and a million of these (an abstract number) will form the wing's cover."

A wing surface is no more inert than a buzz-saw, Davies declares. It is a mechanical device whipping the tar out of the airstream, smashing all its resistance and converting it into work for the plane. That, stripped of elegant technical terms, is "lift." To illustrate this, Davis uses the golfer. The golf club rotates around the hand as a center. Both hand and club are moving—translation and rotation. If the swing is not smooth, the ball won't travel far. A weakling with a steady swing will send the ball farther than a muscular gent with jerky style.

An airfoil is the golf club in opposite action—seizing the ball as it would come to it in a reverse motion picture and killing its resistance. The more smoothly the wing does this with air, the faster the plane will travel with least effort. A wing in flight, to Davis at least, is nothing more than millions of lever arms grabbing and taking the punch out of air.

Where is the mystery in an airfoil so readily explained by its creator? Ah, that is the formula which expresses the most perfect relation between the rotational and translational speeds. With the seemingly endless possibilities involved no less than an Einstein, one would surmise, could arrive at this formula. But Davis calls it a natural conclusion reached once the old ideas of airfoil design are junked.

"I know little about mathematics," he says with a modesty so baffling because of its very sincerity—and in Hollywood, of all places.

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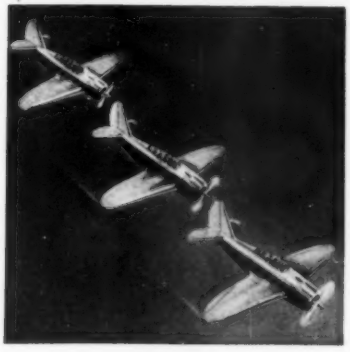

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aeronautical engineering schools was subjected to great stress by the Davis airfoil. Straight-laced engineers claimed that research already had gone as far as possible in this field—that a positive science had been achieved which would tolerate no modification, let alone complete annihilation.

When Davis placed his wing section in wind tunnels to outstrip performance characteristics of the super-airfoils developed by accepted methods, the cry of "black magic" was raised. There must be some trick to it, was the concensus of opinion. And, although the airfoil seemed destined to give America uncontested mastery in plane performance—because 90 per cent wing efficiency in one stroke has been increased to 100 per cent—Davis had to face the almost unbreakable prejudice born of the fear of entrenched engineers. Glenn Martin, for example, became highly interested but was dissuaded by his staff from adopting it. This, despite these facts on the Davis airfoil, as proved in wind tunnels in competition with the most widely used wing section:

1. It showed 25 per cent less profile drag at low speeds and 10 per cent less at high speeds.

2. It showed 20 parts of lift to one of drag, compared with 13 to 1.

But there must be a trick to it, they insisted. All except one of the nation's smartest engineers, another unsung, little-publicized gentleman named I. M. Laddon, chief engineer of Consolidated Aircraft Corporation, San Diego. It took imagination and courage, but when Laddon saw the Davis airfoil perform in the wind tunnel he was sold and proceeded to sell fellow officials.

The section was leased and used on Consolidated's Model 31, launched in May, 1939. With an extremely heavy hull, bomb and torpedo load to carry, this craft will fly in excess of 300 m.p.h. an amazing distance non-stop (reliably reported at 10,000 miles). It is almost as far ahead of its time as the Davis airfoil itself was in 1931, when the patent application was first made after several years' study. Military experts foresee this privately engineered ship as the future nucleus of an invincible U. S. Navy long-range air force.

Then came the sensational B-24, the four-motored bomber which has the Army Air Corps gushing in superlatives. The Davis airfoil again makes it possible, in large measure, for this 20-ton craft to hurtle through the air at better than 300 m.p.h.

Hard-shelled engineers began to crawl out of there ivory towers for a better look at this wing section they had snubbed. Other manufacturers, with Consolidated's example before them, have become quite interested. Whereas previously no amount of pleading could induce them to run their pet designs through wind tunnel tests in competition with Davis airfoil-equipped duplicates, they now are more than willing.

Two major plants (Davis will not reveal their identity, but they probably are Douglas and Boeing—Ed.)—have, since the Model 31 and B-24 began their trail-blazing, undertaken experimental designs around this airfoil. One of the concerns is building a huge landplane and the other a seaplane. Both are believed to be larger than any craft conceived yet and will have military *and* commercial utility, according to Davis.

The Davis section is of most practical value to large ships in which payload and long cruising range are major factors. By cutting down drag and improving lift, this wing section makes possible an increased gasoline or passenger and air express capacity. For instance, should the Davis airfoil be substituted for the conventional type on today's transports, a 15 to 20 per cent greater pay load might be possible, Davis estimated. He pointed out, however, that it would be impractical to switch wing sections on an established type, although it could be done in the same wing area. Fullest benefit can be obtained only when the rest of the plane is engineered with the airfoil in mind.

Davis has received inquiries from numerous foreign governments and he is conducting wind tunnel tests for their benefit, he revealed. In fact, negotiations with one particular country (reliably reported to be England.—Ed.), whose name he cannot disclose because of the international situation, have reached such an advanced stage that before this is published the Davis section may be putting new wings on European aircraft. England, France and Holland are

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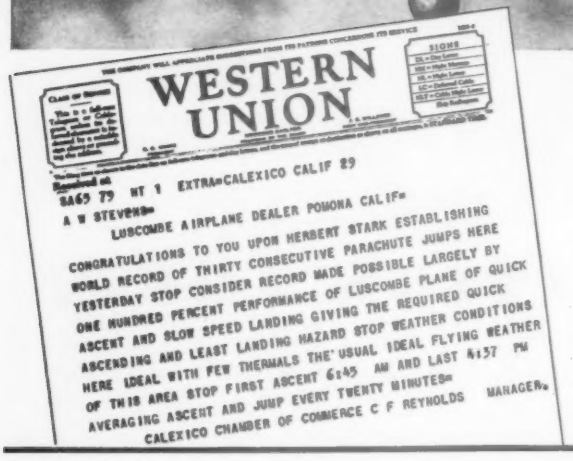
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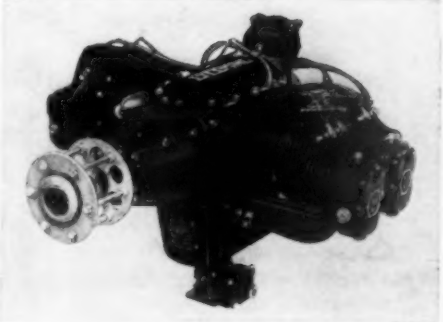

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known to be particularly intrigued with this wing section's possibilities. Davis is not dealng with any nation unfriendly to the United States and he infers that in this classification are those who have discarded the democratic idea.

There is irony in the fact that, whereas Martin might at one time have had access to the Davis airfoil, the avenue to it has been closed today. Martin is looked upon by Davis as in direct competition with Consolidated, to whom he owes a debt that can hardly be repaid in cash alone. The San Diego concern, after all, in a practical way showed the aviation world what Davis had been trying to demonstrate on paper and in the wind tunnel.

After the many years of battling, at thousands of dollars of personal expense, Davis is beginning to realize the monetary reward too few inventors enjoy. He receives, as royalty, one-half of one per cent of the plane's sales price, without engine. At this writing, the only actual production orders for a ship with a Davis airfoil are the Army contracts with Consolidated, totalling $11,365,000 for 46 B-24's. That amounts to approximately $245,000 per plane, or 1,200 a wing to swell Davis' exchequer. Not potatoes, exactly, but aggregating a sum to date that is not generous compensation for more than a decade's efforts.

Queries of light private plane manufacturers on the airfoil have been tabled by Davis to satisfy a quite obvious Army and Navy desire to confine its use, for the present, to secret military craft. He hopes some day to accommodate all concerns desiring his wing section rights. He is frank, however, in admitting that the Davis airfoil probably never will prove as attractive to small craft concerns as to those who specialize in sky juggernauts. "Maximum performance is not as essential in private planes," he explains.

The ideal characteristic of this new wing section is that aircraft performance is better at *every* flying attitude, whether climbing, landing or merely cruising. Not only are top speed, altitude attainment and long-range cruising greatly enhanced but the improved lift actually cuts down landing speed. Hence, the pilot of a plane with a Davis wing section need not fear "hot" landings, Davis maintains.

It is no more expensive to build a plane with the Davis airfoil than the NACA or any other type—provided all the engineering and construction is done, from the outset, with this curve an integral part of the plans. Wing areas of today's standard planes, if fitted with the Davis airfoil would, if anything, be reduced, Davis said, although this can be traceable to a modern tendency toward the heavily loaded wing for speed qualities. Both the Consolidated Model 31 and B-24 are quite heavily loaded per square foot and each plane is phenomenal for speed in its respective class.

The pioneering has been heart-breaking and would have caused a thinner-skinned man than Davis to give up before emerging from the jungle. But he hasn't finished shocking the aviation world. The wing has been his specialty to date and now he is turning his attention to the things that detract from its efficiency. The fuselage, tail and engines are nothing but "unfortunate" drag factors as far as Davis is concerned. And he has set about attacking this problem in a sensational pursuit interceptor, details of which we are not at liberty to disclose except to state it's the closest thing to a flying wing actually tested and proved for performance. The wind tunnel already has demonstrated it is 40 per cent more efficient than any other of that type.

Associated with Davis in development of this plane is W. J. Waterhouse, one of the nation's finest in practical structural work and an illustrious pioneer in his own right. He it was who supervised conversion of the wood construction in the Douglas DT to welded chromolybdenum tubing, a remarkable advance for its time. Affiliated with Glenn Curtiss at Hammondsport, N. Y., Waterhouse has been in aviation since its infant years.

Davis holds no malice for the overwhelming majority of engineers who greeted his airfoil with ridicule. His chief desire is to cooperate with NACA and military experts in practical application of his revolutionary conception. And as for taking the lion's share of credit, nobody need fear Davis for that. Of the only two plane types actually completed and using the Davis airfoil at this writing, he says:

"They were intelligent engineering jobs by Mr. Laddon and his staff. You must realize that my airfoil will show no performance if the rest of the plane isn't clean."

Aviation will have to learn from someone other than David R. Davis how much it owes him.

END

## Guns Grow Larger

(*Continued from page* 11)

coques which make skin as well as framework contribute strength, are so rugged they can often sustain an amazing number of ball ammunition hits. Increased speeds have also reduced the effectiveness of the small-bore weapon. Effective range, with muzzle velocities (an important point in determining how far a projectile will go) which are practical in lightweight guns today, is only 300 yards. After that the bullet falls so swiftly effectiveness of fire is lost. With pursuit and fighter craft 40 to 80 m.p.h. faster than bombers, relative speeds range up to 40 yards a second. A machine-gun fitted ship is in the 300-yard range for only the merest instant before it must turn off.

Though bigger guns have their disadvantages—we'll get to them later—they can solve each of the problems the small-bore machine gun cannot. Weapons up to 37 mm. (an inch and a half) are in regular use. Even heavier guns are undoubtedly on test at various air armament proving grounds in Europe and elsewhere. Let's look them over.

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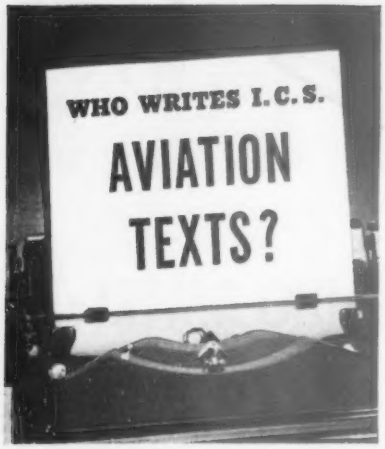


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This was pioneered in the United States, the Colt-Browning gun in Army use being the first such to go aloft and stay there. England has a .50 caliber Vickers; Madsen, the Danish firm many of whose products are on German fighters, has an 11.35 mm (25 mm = 1 inch) weapon which is somewhat smaller. America has another Colt-Browning, this one the Model MG-53, 13.2 mm liquid-cooled weapon aboard the *Double-Wasp*-powered Curtiss XP-42. Belgium's Browning-Fabrique National has a 13.2 mm gun which is very similar.

Hispano-Suiza first put out its famed "moteur canon"—created in the Vee of an in-line engine—during World War I. It was the first of the 20 mm. jobs, many of which have been in use for several years, but which are now gaining greater importance. Hotchkiss (French) also has a 20 mm. model. Germany uses Madsen's 20 mm. weapon. England has none of its own but will use guns of Ally France. A Swedish gunmaker, Oerlikon, has several varieties of 20 mm. weapon. Very similar to these guns, which are called "cannon" most likely because of Hispano-Suiza's "moteur canon" but are really overgrown heavy machine guns, are the 23 mm weapons by Hispano-Suiza, Hotchkiss, Madsen and others. In addition, Hotchkiss has developed a 25 mm gun.

The real artillery, however—and the comers in the field of gunnery aloft—are the still small but growing tribe of 37 mm guns. The American Armament Corporation of New York City has one, the Army Ordnance Corps has worked out its own design in the same caliber (the *Airacuda* is fitted with that weapon), and Germany is testing a Madsen inch-and-a-half aerial field piece.

From .50 caliber up, bullets can be made armor-piercing against present armor. They can also be made explosive—grow, as caliber increases, into full-fledged shells. An explosive shell does not stop at puncturing leak-proof tanks; it explodes them. If it hits a vital piece of framework it does not merely put a hole in it. It blows it up. When it goes through the skin on one side and comes out the other no neat, clean-edged mark is left. A couple of square feet of covering, metal, fabric or plywood are carried with it. Three-hundred-mile-an-hour wind pressure on badly damaged surfaces does the rest. In short, ammunition from .50 caliber inch up tears a plane apart—the necessary job. Protection of pilot and ship against such ammunition will undoubtedly improve as time goes on; this will force calibers up again. But the .50 inch is a satisfactory minimum today.

The .50 caliber gun, in long-barrelled high muzzle velocity form, can also be given double the range of the small-bore weapon, a most commendable gain. The identical gun will not always provide this 600 yards of bee-line flight before gravity turns its flat trajectory into a steepening curve, however. Though relative speeds of chaser and chased will stay much the same, absolute speeds and airstream speeds will rise. Bullets from guns firing forward will face stiffer airstream resistance, cutting their velocity and effective paths. It will be desirable to reduce time of flight and so reduce airstream effect on bullet or shell fired at an angle to the airstream. So, barrels may become longer and ammunition will be fitted with a heavier charge of propellant powder to boost muzzle velocities. Larger guns will also be used, for this reason as well as others, to keep and increase present ranges.

The heavy gun has not just walked into the gun rings and gun ports of today's fighter planes. It has caused many an engineer many a sleepless night. Difficulties in its installation and use fall principally into three categories; weight, volume of fire and recoil, the force with which the gun is driven back as the bursting powder charge sends the shell on its way.

When the term "heavy machine gun" or "heavy gun" is used, exactly what is meant is described. Aviation people need no introduction to the weight headache. Most rifle-caliber machine guns weigh between 19 and 21 pounds without ammunition containers, chutes, fire control or sights. For 50 pounds more, 600 rounds of ammunition can be provided. The average .50 caliber class of weapon weighs just over 50 pounds stripped; 250 rounds of ammunition weigh 100 pounds more. A single 20 mm gun of low muzzle velocity type (i.e., not much good) and only 60 shells weigh 150 pounds. The H-S 20 mm high muzzle velocity type stripped tips the scales at 106 pounds; its 60-shot magazine weighs 55 pounds. And when you get up to the 37 mm stuff you really are giving the weight away: 440 pounds for the American Armament Corporation model, gun alone. Each shell weighs half a kilo (1.1 pounds). Liquid-cooled guns, now attracting interest, are somewhat heavier than the more conventional air-cooled airplane types. Even in a twin-engined fighter not very much more than 1,500 or 1,600 pounds can be given away for armament at present. The armament weight allowance of a single-engined craft is much less.

No matter how good the designer is, his heavy-gun arsenal will not be able to allow the fire volume of a rifle-caliber machine gun battery. Neither so many guns nor so much ammunition can be provided. A new British fighter with a 2,000 h.p. engine (no betrayal by a war correspondent pledged to discretion, as all are. British technical journals have been discussing for some time armament which could go on nothing but a plane of this type) could be fitted either with 12 small-bore weapons, six .50 caliber guns or four 20 mm "cannon." In the first case its rate of fire, if the latest type of English guns are assumed, will be 18,000 rounds a minute. In the second case 4,200 a minute and in the third, 1,200 a minute. Duration of fire as well as rate is least in the case of the "cannon" fitted plane because of the heavy weight of the ammunition. Rates of fire of typical guns of different calibers (remembering the 1,500, 1,800 and even

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more rounds a minute for the most up-to-date rifle-caliber machine guns) are: Vickers .50, 700 a minute; Browning-F.N. 13.2 mm 1,000 a minute; Hispano-Suiza 20 mm 300 a minute; American Armament Corporation 37 mm 90 a minute.

With fewer bullets to waste gunnery will have to become much more of an art than it has been in the past, even though one shell will do the work of a score of bullets. And there will be cases in which the machine gun-fitted craft will continue to take the measure of a more heavily-armed adversary, although outranged. The change may cause a bit of an upset in the air forces of the nations at war. They are concentrating on pouring thousands through their training schools in as little time as humanly possible (some call it "inhumanly possible"). One thing they have been able to abbreviate so far has been study of the fine points of gunnery; they could leave it to the shotgun effect of a multi-machine-gun battery. They will have to teach pilots how to "hunt ducks with a rifle" once more. The change is not likely, however, to affect the get-'em-quick-and-sure group strategy of air warfare at high speeds.

In an effort to secure the effectiveness of the big gun without sacrificing all the advantages of the machine gun's high rate of fire, armament designers are putting mixed arsenals aboard some of the latest fighting ships. Bell's P-39 has a 37 mm cannon and four .30 Colt-Brownings. The French Morane "406" now in action on the Western Front, has a 20 mm gun and two small-bores. The latest Messerschmitt Me-109 uses a 20 mm weapon and four rifle-calibers. Similar mixed armaments are carried by twin-engined fighters: two 37 mm and four .30s on the *Airacuda*, two 23 mm and four .312s on the twin-engined Messerschmitt Me-110, two 23 mm and two rifle-calibers (among other possible armaments) on the Fokker G-1.

The recoil problem is particularly important when the guns are meant to go into wings, turrets or blisters. Not much publicly-acknowledged thinking on this knotty problem has been done. When only small-bore weapons are concerned, it is slight enough to have been left largely alone. But the sign that it is a headache and is attracting attention is the appearance of a considerable number of articles on the subject—mostly enormously complicated mathematical anlyses—in the foreign technical press in recent months. The recoil weight of a typical rifle-caliber machine gun is about 125 pounds, of a .50 caliber weapon, 350 pounds; 20 and 23 mm, 400 to 450 pounds and 37 mm, nearly a ton. That much recoil can do a lot of damage to a finely-balanced aircraft structure if the shock is not properly absorbed.

Despite these difficulties the big gun will win—and the bigger the better. Ability of a single shell to do fatal damage increases even more rapidly than weight, particularly between 20 and 27 mm. There are several reasons for this. Any explosive shell fired into the air (anti-aircraft or from a plane) must carry a self-destroying fuse to explode the shell after a particular interval if it fails to find a target, in order not to make life too unsafe for the chap on the ground. By the time this and other special equipment is fitted there is little space in the 20 mm shell for anti-enemy dynamite. Shells ought also to have a safety jigger which is not released until the shell is out of the gun in order to guarantee there is no premature explosion of the shell (set off by the bursting of the propellant). This does not happen often, but when it does it is highly fatal to the triggerman instead of his target. None of the 20 or 23 mm shells can or do carry this handy gadget.

So, if you wake up some morning and read that some fellow has gone and put an eight-inch howitzer in the nose of that thar new fighter, don't be too surprised. We warned you.

END

## I Learned About . . .

(*Continued from page 35*)

Cautioning my companions to hold their hats, I decided to come in while I still had power. We dragged the site of our expected demise once and circled for a long low approach. As we came in with flaps down hanging on the prop, the telephone poles slipped by on my side like a picket fence. Just as we were settling down below the level of the telephone poles that I had my eyes glued on, Cooper yelled, "Dy'a see that tree?" I answered him with a burst of gun that lifted us by inches over a little scrub tree on his side. After that unintentional zoom we began a sudden and very definite squash that felt like when we got there we would stay there; perhaps you know the feeling. Two seconds later we plopped into the dead center of that road on all three wheels in a convincing demonstration of Newton's original theory and rolled to a stop directly in front of a rusty pump of the gas station.

Doc leans out of his side window as the startled gas station attendant popped out of his shack, stopped short in his tracks and stared. "Put in 10, please," says Doc and the guy walks over in a trance and dumps it in. It was then learned that when the gauges read empty in the "24", you still have about four gallons in each tank—which is practically an hour's cruising.

We took on the 10 gallons anyway, shooed off the crowd of curious tourists, ran the gauntlet of telephone poles on one side and high brush on the other and finally got up and clear. The Ranger seemed to run better on motor fuel than on aviation gasoline. There was no dozing from there into Miami, the air was too blue from cursing my dumbness.

A few years of working with gasoline systems that would put Rube Goldberg to shame had made me callously complacent about a simple two-tank gravity feed system. What burned me up was that we had risked our necks, our airplane and peace of mind unnecessarily since we had sufficient gasoline aboard to make our destination without the extra 10 gallons we took aboard. Every gasoline system has its own peculiarities, even the simple ones. Had I been thoroughly conversant with this one we would have been saved a lot of embarrassment. Incidentally, an emergency landing field half way between Miami and Key West would be a help, especially to the little fellows and to boondoggling nitwits.

Believe me, you can't know too much about your gasoline system.

END

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## Laws of Aerial Warfare

(*Continued from page 21*)

International law in general is a strange, forbidding subject. But international law as it pertains to war waged in the clouds is relatively simple and easily understood. Briefly, it grew out of the unholy alliance of chemistry and aviation in the World War. The rain of poison gas, tissue-burning liquids, germ-carrying confetti and incendiary fire-balls on both sides of the western front caused a deep-seated feeling of revulsion not only on the part of the belligerents affected but upon the whole world. Thus, shortly after the Treaty of Versailles was signed, the attention of the League of Nations was directed to the matter of providing curbs upon strife in the air.

The principal purpose of air warfare always has been to exert pressure, chiefly psychological, upon an enemy's "home folks." Thus the first move, after war has been declared, usually takes the form of an impressive show of air might—a bombardment of a military objective not too far away from a civilian concentration.

The accepted rules regarding aerial bombardment are explicit. Strictly military objectives—powder magazines, munitions dumps, army air bases and the like—may be attacked at any time. Factories engaged in the manufacture of arms, munitions and war supplies are legitimate as targets. Lines of communication and transportation used for military purposes may permissibly be blasted out of business. Neither the night bombing of office and government buildings housing war department workers, nor the bloodless devastation of non-military property, is frowned upon by law.

But the reckless blowing up of densely populated city streets not in the vicinity of a military base, the wanton laying waste of churches, monuments and hospitals, the use of bombs containing poisonous or disease-bearing materials—in fact, any reckless bombing that indicates a feeling of indifference to the wide repercussions and sufferings of its victims—is prohibited. In the current war both Germany and the Allies insist that they are voluntarily living up to the rules of air war. "We could bombard any of your larger cities," each says in effect, "but we want to be humane." Actually the stalemate in the clouds undoubtedly is due in large part to a lack of real air strength on both sides. But the fact remains that, in observing the air-rules of the Hague, civilian populations have been spared through five long months of war and much needless suffering has been happily avoided.

Propaganda from the air is comparatively new as an approach to the minds of enemy fighting forces and civilians. England's Royal Air Force spread thousands of handbills in German cities during the first weeks of the war; the Germans used the same technique against the Poles, the Russians against Finland. Each urged the enemy either to revolt or to surrender and some contained veiled threats of punitive measures. International law, to date, puts no restrictions on such methods. Nearly every nation spread its propaganda from aircraft during the world war and, in the face of the practice then established, it would be almost impossible for any power to complain at this late date that such action is unlawful. The British government in particular put itself on record in 1918 as not recognizing the distribution of leaflets from the air as a breach of international law. Two British airmen had been captured in Germany with a stack of pamphlets telling of the good conditions in England's prison camps. They were just about to be shot when their country lodged a protest. The mere threat of reprisals was enough to make the German high command give them their freedom.

In aerial combat, however, the old "anything goes" policy no longer holds. Fighting craft have certain rules to which they must adhere and the absolute necessity for these rules is so well understood by both sides that they are rarely questioned; hardly ever violated.

Only "combatant aircraft" may engage in fights. Private aircraft cannot attack military planes and, in return, they are immune from attack. Flying ambulances are exempt from capture as long as they are not used for military purposes, do not hamper the movements of combatants and are painted with a white-bordered red cross on all surfaces.

Fighting planes must be distinctly marked. The Allies in the last war used a *cocarde*—three circles of red, white, and blue within one another: The American center circle was white, the British, red, and the French, blue—as a distinctive marker. Uniformity is necessary in order that one plane will not attack another of a friendly nation and in order that ground batteries will not fire upon their own ships. False markings are forbidden and camouflage is permissible only as long as it does not obscure the nationality symbol.

No quarter can be given in an air fight. An airman cannot surrender by holding up his hands as on land, although there are a few scattered cases of thus "captured" enemy aircraft being brought unharmed into an airport. It is perfectly legitimate for a whole squadron to pounce upon a lone aircraft, nor is it necessary to cease attacking when the plane seems helpless because this may be only a ruse to escape.

Legally, an aviator jumping from his disabled plane in a parachute may be shot down in cold blood (he undoubtedly is armed and might conceivably be bent on sabotage or spy work). Actually, it is customary to spare the victim's life out of pure sportsmanship.

A pilot who has been forced down behind the enemy's front lines may not be unduly punished if he scuttles his machine by fire or otherwise because this may be a portion of his military duty. However, it is just as much the duty of the enemy to prevent him from doing so if possible—even to the extreme extent of shooting him.

Ramming an enemy airplane is legitimate in warfare; but nearly always it means taking two lives for one and therefore is not justifiable except in extreme cases.

There are certain "tricks of the trade" that are legally acceptable and a few that aren't. It is perfectly all right, for instance, to simulate a tailspin, nose-dive or a fall out of control when attacking or escaping from attack. It is acceptable to "play dead" on the ground until attacking planes have flown away. The use of decoy craft to draw the enemy to the ground or to attract the fire of anti-aircraft is not frowned upon. There was no objection when the Germans turned their anti-aircraft units on their own planes (being careful not to hit them) in order to draw in a group of Allied craft.

Ground crews may plant false flares as long as no civil planes are overhead. Dummy camps and fortifications may be built to draw enemy air fire and dummy battle operations may be carried out

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when observation planes are in the sky. But it is *not* permissible to bombard or to rake with gunfire troops that show themselves unmistakably ready to surrender. It is not considered square for a pilot to land, play dead until his captor drops beside him and then shoot him. It is not just cricket for a plane to give the international landing signal—equivalent to an SOS—and then bomb an airport when its lights go on.

An airplane of a belligerent, crossing a neutral frontier, finds itself in plenty of hot water. The neutral government is expected to use every means within its power to force the ship down. Both plane and pilots must be interned for the duration of the war once they touch neutral ground. Occasionally concession might be made for a craft in extreme distress, but in practice this is most infrequent. Now and then an airman crossing into neutral territory is found to be deserting from his country's armed force. By law he and his ship must be interned, although a deserter crossing the same border by foot is allowed to go free.

Like most laws, the rules of air warfare may at times be broken with impunity. Once a belligerent sets aside one of the Hague precepts because he feels it inappropriate to new conditions, others usually must follow suit. Thus did the Allies justify their use of poison gas in the world war, citing Germany's earlier employment of it. There are also cases of "extreme military necessity" where even cold-blooded mass slaughter raining from the air can be condoned and civilian establishments—even hospitals—bombed. Usually in such cases warning is given so that the areas affected can be at least partially evacuated.

The German high command in particular, in the early days of the last war, maintained that military necessity knew no law; that the rules of warfare were all right as long—and only as long—as they did not hinder the accomplishment of the war's objective. It was the heavy weight of world opinion that forced a modification of this stand and an acceptance on the part of every nation of the "civilized" methods of modern air warfare. Only in extreme desperation would any nation, nowadays, dare throw these into discard and turn loose the full fury of her sky war dogs. To do so would mean a horrible surrender of nearly all that civilization has been able to accomplish through the centuries.

But already there are signs of desperation—and who dares prophesy the future?

END

## Homemade Hero

(*Continued from page* 29)

of first aid equipment—and a special milk formula for the baby.

Roads were hopelessly blocked and the situation seemed desperate—until somebody in Perryton remembered Harold Hawk. Hawk is a wholesale oil dealer in Perryton—when he isn't out at his own airport tinkering with some new gadget He has a herd of 150 cattle and, when the sub-zero weather and deep snow settled over the ranges, it looked like Hawk was going to lose those cattle by starvation and freezing—but he didn't. With the aid of Howard Holt and Kenneth Crisp, a plumber and a jeweler, Hawk had equipped his plane with a crude pair of homemade skiis—the first skiis ever placed on an airplane in the state of Texas. Once the skiis had been built and test-flown, it was a simple task for Hawk to fly feed 20 miles to his hungry cattle.

It was just as simple a task for this self-taught flyer to bring help to the Kings for, early the next morning, with the wind still blowing dangerously, he delivered the first aid supplies and special milk to the booster plant. That afternoon he returned and flew Mr. King, whose feet were frozen, back to the Perryton hospital. On the second trip he bundled the mother and two children (carrying the baby on *his* lap) into the plane and, 20 minutes later, they too were receiving much-needed hospitalization.

The next day Hawk flew Fred Tarbox the 35 miles back to his ranch, the latter having been stranded in Perryton by blocked highways. Returning, Hawk noticed a car stalled in deep drifts Swinging low he sought signs of life but found none. Still, there were no tracks leading from the car. So Hawk landed and taxied close.

Inside the car he could see the huddled figure of a man. It was Oscar Flowers, Ochiltree County attorney, whose hands and feet were badly frozen. He had been forced to sit all night in the heaterless car with the thermometer hovering around the five-below mark. Again Hawk bundled a cold-stiffened passenger into his homemade plane and the Perryton hospital soon had another patient.

Ray Houston, a young Perryton resident, had been caught by the blizzard at an outlying ranch house. He was safe enough, but his mother became worried about him. So once more Hawk cranked up his plane, this time to bring a lad home so his mother could stop worrying.

During lulls in this rescue work and everyday trips to feed his cattle, Hawk dabbled a bit at mail carrying. He gathered up the mail at the Perryton post office then flew a route of his own choosing, dropping letters to snowbound ranchers after attracting their attention by zooming low over the ranch houses.

These are the highlights of a brief span of heroism that has brought Harold Hawk nationwide newspaper attention. But without the background of the man, they don't assume their real significance.

In 1934 he built his plane, a Pietenpol, powering it with a Model "A" Ford engine. It took him a year and a half to complete the job, but even then he had a long way to go—there wasn't anybody to teach him to fly.

So Harold did the next best thing—he taught himself to fly. For 35 hours he taxied the little two-passenger, open cockpit job around his pasture, sometimes lifting it a foot or so off the ground. Then one day a forgotten fence loomed suddenly ahead—and a flyer was born. Since that first unwitting solo flight, Hawk has rolled up over 900 hours in the air and has soloed 18 students on the same plane. But the thing that brings a glow of pride to his eyes are those homemade skiis. They're made of two oak planks, four feet long and six inches wide. The curved tips are metal which was bent into shape and bolted to the wooden runners. To keep the skiis in position during flight and still provide the necessary "give" for landings, Hawk and his co-workers used two screen-door springs, attached to the brace wires.

Neither Holt, Hawk nor Crisp had ever seen an airplane ski before they set about building this pair—but so far these skiis have made about 200 take-offs and landings in 75 hours of flying—and they haven't missed yet.

The Pietenpol cost Hawk $500 and many hours to build. The four-cylinder engine is not converted in any way and cooling is secured by half of a regular Ford radiator mounted in the cowling behind the engine. The plane cruises at 100 m.p.h. and gets automobile gasoline mileage.

What does Hawk think of all this effort to make him a hero? Well, he "allows it's kinda nice to know that people are interested enough to drive 200 miles to see him and his plane," but he thinks he got his greatest kick when the doctor said the two-year old girl wasn't going to lose use of her arms because they were frozen.

END

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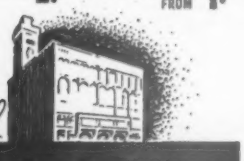
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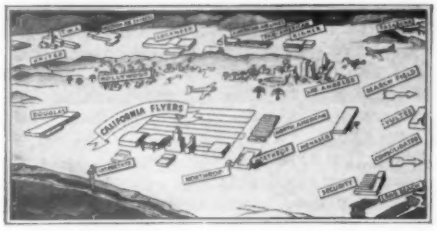


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## Soup's On!

(*Continued from page 32*)

definitely out of the "dainties" class. She says that the majority of airline passengers are men and she firmly believes that men appreciate simple tasty foods. She believes that they do not like the tea-room type of meals. And so she is constantly compromising in order to balance up solid nourishing foods with light but not frivolous desserts and garnishments.

As the airplanes used by the airline operators became larger the weight allowances for food increased. It became possible to supply thermos pans for ever-larger quantities of hot food. From coffee and sandwiches it became possible to supply first a cold buffet luncheon. Then hot soup was added. Finally, with most of the lines flying Douglas DC-3s, the Perrigo menu has been expanded to include a hot meat, several hot vegetables, coffee, tea, milk or chocolate, hot soup, relishes, a cold salad and a cold dessert.

The early days found passengers eating out of oiled paper. Today Mrs. Perrigo's luncheons are put together on aluminum trays with either paper or china plates, real silver, unbreakable cups and glasses for fluids and gleaming linen napkins such as might be found in the finest hotels. She and some of the other airline caterers have been experimenting recently with a moulded paper container for a luncheon and dinner tray. Such trays would be lighter than aluminum and could be discarded after use.

Menus vary greatly with weather aboard the airlines as well as elsewhere. In mid-summer the meat course usually consists of cold cuts. The rest of the meal will be a lettuce salad with aspic and fruit. Dessert will be fresh fruits in season. Strawberries are favorites because they stay beautiful to the eye as well as tasty to the tongue for long periods. Peaches, Mrs. Perrigo says, seldom are served fresh because they turn brown soon after being cut.

Occasionally Mrs. Perrigo tries new experiments. She is constantly devising new kinds of light breads. One of her specialties is nut bread and she constantly bakes new kinds of raisin and corn breads. Also, she has begun experiments with meats. Chops, particularly lamb, are being served occasionally during cooler weather. Mrs. Perrigo is watching the passenger reaction to this closely. She says that, when kept hot in thermos pans, lamb chops are delicious.

"One thing we constantly keep in mind," she says, "is the prevalence of dieting among airline passengers. We can't make our meals fattening. Too many men as well as women, have kicked about that point. So we make it a habit to balance the meal pretty well between proteins and non-fattening vegetables with a few carbohydrates, fats and sugars thrown in. Anyone on a strict diet can easily avoid the pitfalls in my meals."

The airline operators more or less agree upon standards for meals in the same way that they agree on standards for flying equipment. Braniff Airways likes the same kind and quality of food that is demanded by Pennsylvania Central or American Airlines. The differences are usually due to individual taste of the officials in the given lines whose duties are those of watching over food for the entire system.

Mrs. Perrigo's business is far from haphazard. She serves an average of 9,000 meals a month these days—no small job by any catering standards. Every phase of the business must be operated with great care and forethought, she says. Probably more time is spent in conference over the meals served aboard airlines than over the food that is prepared in the best hotels or the most famous restaurants in the United States.

All this keeps Mrs. Perrigo constantly on the run. She works today in conjunction with all two of the airlines operating out of Chicago airport. These two happen to be a couple of her oldest customers—United Air Lines and Transcontinental & Western Air. United opened its own commissary at Chicago two years ago. TWA opened one there last January 1. The lines that now use Mrs. Perrigo's food at Chicago are American Airlines, Braniff Airways, Chicago & Southern, Eastern, Northwest and Pennsylvania Central.

Mrs. Perrigo still has her kitchens and headquarters in the Clearing hotel. It is much larger now, with several brick additions to the original structure. There are many more rooms available for pilots, crews and stewardesses who stop at Chicago as well as the culinary department. The kitchens are in the north wing on two levels. They are among the most modern in Chicago with huge ranges, electric ice boxes of wonderful capacities, salad tables, electric mixing devices and the finest of general equipment. Mrs. Perrigo estimates that she has an investment of more than $7,000 in these alone.

In the daily preparation and delivery of food she has established a definite routine: she confers with airline commissary officials and plans her menus a week or more in advance. These are flexible plans that may be changed by weather or other exigencies but they permit her to do her buying on a long-range schedule. Deliveries to the kitchens are coordinated to provide the materials needed on the day required for their preparation. It is her boast today that her service is 100 per cent reliable and she demands the same sort of unswerving reliability from the grocery, meat and other merchants with whom she deals.

The day arrives for the serving of a given meal, we'll say, for Blank Airlines. The day's schedules go to the chief cook who coordinates kitchen efforts. (Mrs. Perrigo's brother Ed does much of this work these days.) Let's assume the menu reads thus:

Cream of Tomato Soup
Pickles Olives Celery
Fried Chicken, Southern style
Mashed Potatoes Creamed Peas
Cottage Cheese Salad Rolls and Butter
Ice Cream Coffee

The menu is split up into its component parts. Soups are handled on one of the five huge gas ranges. Relishes and salads are prepared in the salad room. The chief cook watches the broiling of the chicken. Another cook prepares the peas. The mashed potatoes are among the most carefully watched dishes. They must be whipped until they are as light as whipped cream; for potatoes tend to gain weight—or at least seem to gain weight—when flown two miles above ground.

A huge board in the kitchen lists the departure time of every trip that is being served and the same board lists the time when the food for each of these trips must be finished and placed in its proper containers for transportation to the airport. About two hours before departure of the flight the passenger agent for Blank lines consults his load chart to see how many passengers are booked. Then he telephones to Perrigo's the number of meals required under his estimate. Mrs. Perrigo or one of her assistants relays the infor-

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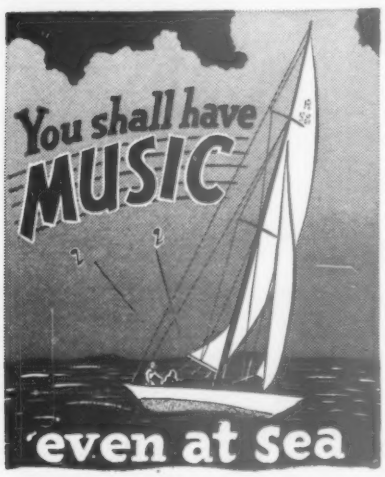


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Age_____

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6-30-PA

mation to the cooks and food packers. About an hour before the plane's departure final preparations are made in the kitchens. Salads, desserts, bread, crackers, butter and salt and pepper all are packed in individual containers. These are, in turn, packed in handy baskets. Finally the main course, heated piping hot, is placed in a large vacuum pan where it will remain until the stewardess assembles the meals in the air. The hot soup, vegetables and potatoes are put in other vacuum containers. All these are assembled in one of Mrs. Perrigo's two green trucks

The truck is driven to the airport and out onto the loading ramp. The driver stops beside the airplane that, if all goes according to the smooth arrangements usually made, is already out in front of the terminal building. With the assistance of the ground crew the Perrigo driver places the freshly prepared food in the airliner's kitchen compartments. All is checked by a commissary department agent who then turns the guarding and dispensing of the food over to the stewardess assigned to the airplane.

Mrs. Perrigo is as weather conscious as an airline pilot. She's found that this is absolutely essential—the point being that a cancelled trip might mean the loss of 21 meals already cooked and packed ready for departure. She gets the utmost in cooperation from the airline weather forecasters employed by the companies she serves yet, with all her own experience and their assistance, she occasionally loses meals.

Another item that requires constant care in planning is the distance of a given trip. Suppose it is necessary to serve food on the short flight from Chicago to Detroit—1 hour 20 minutes—or on the flight from Chicago to St. Louis which is hardly longer. In such cases it is necessary to adopt simple menus that will enable stewardesses to get the food out, served and collected before the flight is over. Through long practice Mrs. Perrigo has become an artist in such planning. On longer non-stop trips this factor is not important.

Every now and then some unusually fussy passenger or some celebrity orders special food. It is Mrs. Perrigo's delight to provide anything within reason for a special meal on short notice. Usually, when one passenger orders special food on a given flight the entire airplane receives the same meal. This is done because it is considered proper for all meals on the plane to be alike. Mrs. Perrigo also carries a large stock of baby foods that she can supply when required.

One point she emphasizes. Menus aboard airplanes vary every day. If a constant rider of the lines should have dinner aboard the same company's planes two or three times in a week he would find the menu different each time he rode. Special meals are prepared for holidays—Christmas, Thanksgiving and the like. These special meals follow the time-established American holiday menus—turkey and trimmings from cranberry sauce to oyster dressing, favors, plum pudding, etc.

Intensely interested in aviation trends because they affect her own business so vitally, Mrs. Perrigo was as excited as any airline executive when this writer last saw her. The airlines just had completed a full year of service in which not a single passenger, crew-member or other person was killed—a record that no other form of transportation agency ever approached. She, along with everyone else in the industry, believes that the air transportation business has just begun to roll.

END


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## Wail of Two Cities

(*Continued from page 34*)

east side of the Hudson and reached its climax in the hearing of the C. A. A. last September, the result of which was the naming of Newark and North Beach as co-terminals for the metropolitan area on November 7, 1939. (The airlines started operations at New York December 2, a day of rain and low ceiling when more flights used Newark than the new port.)

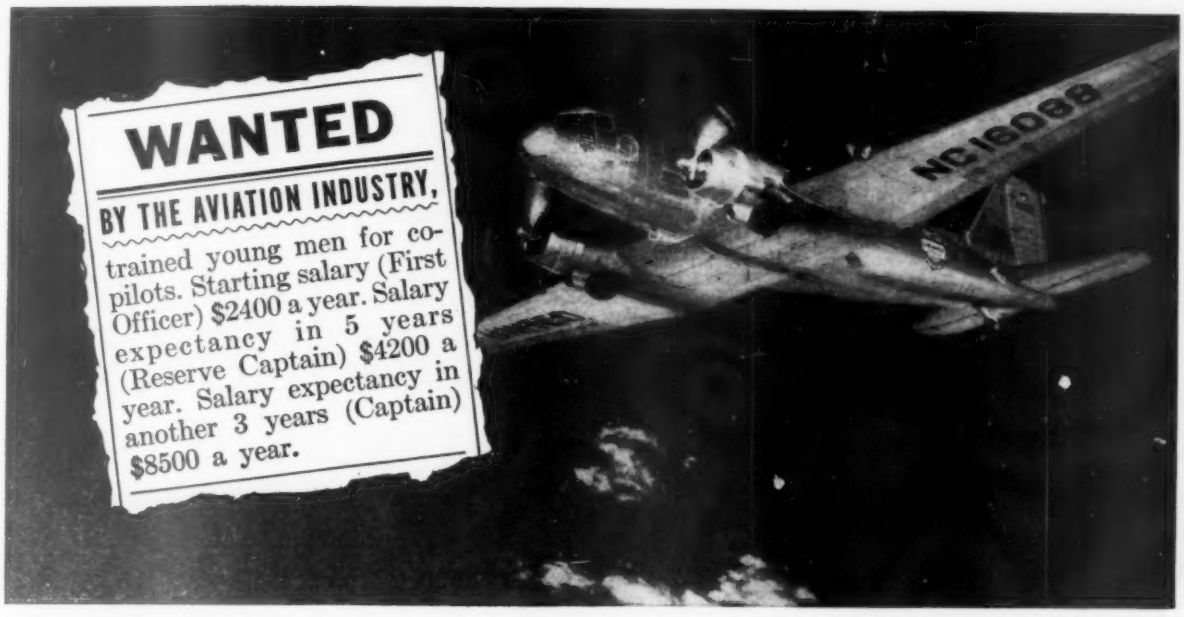
Ordinarily, such a move on the part of a governing agency would have settled the question but Meyer C. Ellenstein, Newark's chief executive, had long boasted of his city's reputation as the transportation center of the east and had spent large sums to improve his airport with an administration building and a $2,000,000 hangar which was finished just as the airlines skipped over to New York, leaving Newark a minor stop on all of the transcontinental airways.

Dedication day—October 15—was a high point in the life of Fiorella LaGuardia, the mayor of New York who had worked unceasingly and spent $40,000,000 before he could woo the airlines away from Ellenstein. Two hundred thousand citizens gathered on this sunblessed day for a look at New York's bid for first honors as an aviation center. A triumphant sight to the mayor were the six $1,500,000 hangars, each larger than Madison Square Garden; the huge, circular administration building; the long runways; the intricate lighting systems; the pneumatic tubes from ticket counters to ramp offices; the private planes and Navy planes and transports of five airlines; the thousands and thousands of persons come to glory with him in the city's new industry.

As he spoke a woman stepped between him and the audience and paraded up and down flouting a sign that proclaimed "Newark still has the World's Greatest Airport!" The crowd was sprinkled with a burst of titters. LaGuardia's voice wavered but, as the girl was escorted from the field by the police, it gained its full volume and continued as before.

It was a small incident but a prophetic one, for LaGuardia has been harassed continually since then by Meyer Ellenstein, who won't admit he's lost the tug-of-war over the airlines. Trying to embarass LaGuardia with every conceivable weapon at hand. Newark's prexy saw to it that Senator W. Warren Barbour (R.-N.J.) put a resolution through the Senate to investigate the C. A. A.'s decision in regard to the two airports; he appealed the same decision to the Circuit Court of Appeals in Philadelphia and set out to find whether the airlines are legally filling the provision of the C. A. A. that said they would have to continue to serve Newark with "adequate schedules."

His men have been monitoring the North Beach control tower frequency in an attempt to prove that planes operating to and from the new port are frequently delayed by cross traffic from nearby Floyd Bennett, Mitchel and Roosevelt fields. He has threatened to expel the three lines still using quarters at Newark altogether and to rent the new hangar out to manufacturing interests. One firm—the Brewster Aeronautical Corp.—already has rented space in the hangar. He drew up weather averages that purported to show Newark has better weather than North Beach, but these were later shown to be erroneous. Police forcibly ejected eight Newark students from the observation deck January 28, when they tried to distribute handbills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to specators "proving" Newark superior to North Beach.

The pressure applied to the airlines has not passed unnoticed. After the first month's operation from North Beach—December—schedules into Newark were increased to accommodate the loads from that point. When they moved, American, United and TWA suspended coach service between Newark and the Big City, but United later found it advisable to reinstate limousine schedules for three of its flights. All indications are that the move to provide Newark with more schedules and more service is on.

New Jersey residents and businessmen have not been backward in expressing their disgust and letters to the airlines from these travelers indicate that an important market is impaired. Dick Kirschbaum, Newark aviation editor, has received letters from 10 large firms, declaring their intention to cut down as much as possible on air mail and air express until better service is rendered them.

Competition from American on the New York to Washington route finally forced Eastern Air Lines, which has continually supported Newark, to move to New York. However, President E. V. Rickenbacker, who is something of a fighter himself, refuses to concede North Beach is superior and will operate only about half his flights from that point and will retain the balance of his operations at Newark. He believes—as many experts do—that expansion of the industry will eventually make Newark as big a center as it used to be.

The Big Three airlines still want to rent hangar space at Newark, but whether they will get it or not depends largely on what Ellenstein feels he can get in return, either in the form of rents or increased schedules.

Meanwhile, building activity goes on apace at North Beach. Another huge hangar is going up to accommodate Eastern and Canadian Colonial Airways and the small hangar for itinerant craft is on the drawing boards. Plans are afoot to erect a small hotel on the grounds and the city council has voted money for a ground school to be called the Academy of Aeronautical Sciences. All this in addition to the three still unfinished hangars already rented to United and TWA.

The Democratic administration in New York frowns deeply upon all the the expense of LaGuardia field and it used Colonel Somervell's statement admitting North Beach cost 15 per cent to 20 per cent more than it would have under private contractors in an attempt to make Hizzoner squirm. But Fiorello has bigger things to squirm about.

Over at Newark they jeer at the "doodad" airport. They say it isn't the size of the hangars or the design of the administration building that makes an airport. Given good runways, an airport is judged by its convenience for passengers and mail, they say, and by its weather and freedom from obstructions. And, since Newark is closer to downtown New York in point of time and has at least as good weather, and since New Jersey is as big a residential center as lower Long Island—what's all the shouting about?

So they stick to Newark, those who have faith in it: Eddie Rickenbacker and his crew, Ed Middleton and all the other airline employes who are not looking back to the days when Newark was the airline center of the east, but forward to the day when it will have regained its greatness.

But Meyer Ellenstein isn't patiently waiting for the future to bring Newark back into the limelight. He's in there fighting LaGuardia every inch of the way. And who knows? Maybe he'll win a decision.

END

## Workhorse Squadron

(*Continued from page* 26)

L. H. Dunlap, now post technical inspector, and consisted of 10 officer pilots, three non-commissioned officer pilots and 80 enlisted men. With the Army expansion program, new transport squadrons were created and the 7th was among those that came into existence. Mechanics and enlisted men were transferred from Salt Lake City, Oakland and Fort Sill, Okla. As this article is written there are between 50 and 60 enlisted men in each squadron and a combined pilot force of 32 officer flyers and three non-commissioned officer pilots.

During October, 1939, the Sacramento squadrons moved 96,600 pounds of freight and 14 passengers. The ton miles were 62,981; the miles flown, 73,391; hours in the air, 489. Average flying time per pilot was 77 hours. The October total for all service squadrons adds up to 496,962 pounds moved and 182 passengers carried; ton miles were 295,193, and miles covered, 298,848. Hours flown totaled 1,991.

If these figures are impressive consider the totals for the calendar year (up to November). The 4th and 7th Squadrons moved 677,283 pounds and flew 225 passengers. Total mileage was 508,027 and the total ton mileage 502,723. Flying hours reached 3,362 and the average time per pilot was 477 hours. Total pounds moved by the entire group of air freighters was 3,142,278.

This one figure shows the importance of the transport squadrons. Passengers carried by all service squadrons totaled 1,777 and the ton miles tallied to 1,911,522 as compared to a total mileage of 1,928,066. Flying hours amounted to 12,758. In considering these figures keep in mind the fact that, as Lieutenant Sailor explained it, "our flyers have cut the transportation time of supplies from five months—by water from the Atlantic coast to the Pacific—to two days or less."

Of course, the ships of the sky don't monopolize freight shipments to the detriment of railroads and truck companies but, when speed is vital, the transport squadrons—instead of the Marines—are there.

END

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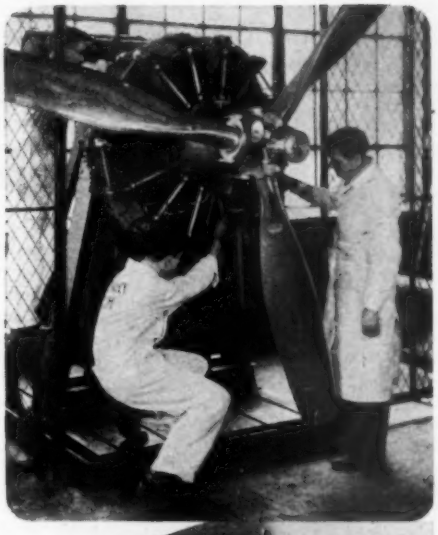

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## Eagles with Clipped Wings

(*Continued from page 23*)

for manning the 3,000-plane program, by June 30, 1940, there would be a shortage of 715 aviators of the regular Navy and, at the close of the fiscal year 1941, this number would leap to 845. Naval reserve ensigns and junior grade lieutenants, drawn from civilian life and antcipating but temporary employment, would be required to fill this deficiency, he stated.

This, then, at a time when Navy flyers of established experience and skill—some with international reputations— were to be dumped overboard because a selection board had considered them part of an undesirable "hump" created by the enlistment of numerous young adventurers during the War.

None of the this group graduated from Annapolis. All went into the Navy as enlisted men during the World War. They volunteered for flight training. Qualified as Naval aviators following the course at Pensacola, they were given commissions in the reserve force as ensigns. The war over, services of many of these flyers were still required for the infant Navy air fleet. Stiff examinations were given to determine whether they were entitled to commissions in the regular Navy. Those who passed were duly commissioned and assured employment until disability or the retirement age of 64. In that contingent were the eight "eagles" who, for the past two years have seen ahead only a blank wall of retirement—two decades prematurely, on the basis of a promise taken at face value. These were the men who, assigned as instructors at Pensacola, trained Naval Academy graduates now senior to them and preparing for promotion to the rank of captain.

Naval aviation gained in size and complexity. The wartime pilots were needed to fill important jobs requiring the utmost of flying skill. Racing became an approved Navy activity. To win the Schneider and Pulitzer Cups was considered evidence of real aeronautical progress. Harold Brow, teaming with happy-go-lucky Al Williams (another of this World War company), performed sensationally in the Pulitzer races. Rittenhouse was the widely-acclaimed Schneider ace.

Then came the carriers, with the experimental *Langley* in the middle 1920's. And the adaptation of landplanes to operations with forces afloat was placed in the hands of such men as Brow, Lyon and Crinkley. There was extreme danger to this job. The planes had no flotation gear to provide emergency buoyancy in crash landings. No radio facilities were available for continuous contact with the carrier—you went out hundreds of miles and depended on perfect navigation to find the speck in the sea that was your only landing field. There were no turn and bank or climb indicators. You worked with inadequate apparatus, glad to serve your country, little realizing you would be considered for the official guillotine even if you behaved.

Long-range patrol plane development was the next major milestone. Lyon and Crinkley were detailed, in 1926, to conduct tests at Anacostia on planes built by Curtiss and Wright for long distance overseas work. They established a world's record for endurance, approximately 21 hours, with a single-engined (500 h.p. Wright *Tornado*) long-range flying-boat.

A Navy officer, according to doctrine that has varied little since aviation began playing hob with tradition, must be fully schooled in duties aboard ship to merit promotion—even if he is first and foremost an aviator. These flyers were assigned to vessels but, contrary to others of the flying service who stuck to purely routine ship duties while at sea, their functions were in connection with flying. On shipboard, they remained aviators.

Denials cannot gainsay past performances of selection boards that have shown discrimination against people of that category. The board, headed by Rear Adm. Frederick J. Horne to study the aviation personnel situation, recently made a special point of the fact that the qualifications of a Naval aviator should be viewed as an added asset and not a specialty divorcing him from the line of the Navy and that his status as a flyer should not be prejudicial to his career.

Where there's smoke, there must have been a fire. The usual excuse—and this was borne out by one selection board member who told it to a "passed over" officer—is that the flyer has not had a "balanced" Naval career.

One Navy pilot put it succinctly:

"The cheapest combat planes bought today cost about $50,000. They're high-powered and speedy and it requires almost a superman to fly them. Yet, the pilot is told his real job is pounding the deck of a battleship. What is aviation supposed to be in the Navy—just a side line?"

A Navy aviator today thus must know not only his own specialty but must have an insight into the fireroom, the fire control mechanism, the communications apparatus, in order to gain promotion.

Those who object to this scheme of things point out that this is 1940, not 1905—when the Navy had only surface ships. Aviation is the most highly specialized profession in the world, they say, and a man cannot spend enough time in this occupation to become a master.

They contrast the Navy's system with that of the Army, where an aviator doesn't have to compete with the cavalry or the infantry to go up in the ranks. All this eventually has come to the attention of Congressional committees. Militant solons took matters in their hands and determined to push through legislation which would afford at least four more years active duty to those found fitted by selection boards but doomed to retirement by June, 1940. And as this is written the Senate and House conferees have failed to break a stalemate in discussion of H.R. 4929, which aims to correct injustices in the Naval Personnel Act of 1938.

As if to make the situation more contradictory, while such able men face the exit gate, large numbers of retired officers have been recalled to active duty to fill billets in the present emergency. Some of them have been out of the Navy *as much as 10 years*. Two are 66 years of age and one has been on the retirement list *since 1914*. When they were retired, they were unfit for promotion in the active ranks. Today they seem to meet the requirements, while men in their middle 40's, in the best of health and with a background of valiant pioneering, were marked for the Great Outside.

"I do not attempt to deny in any way that competent officers are being retired through the selection system," recently declared Rear Adm. Chester W. Nimitz, chief of the Bureau of Navigation, to the House Naval Affairs Committee.

The American public, which is footing the bill, certainly is entitled to efficient administration. And with it, justice for men who have contributed immeasurably to the science of flying—such as the eight Naval airmen over whom a Damocles sword has been hanging.

END


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## The Deadly Show-Off

(*Continued from page 39*)

accident and heading toward the Newton Hospital. I decided to lie down in the street and see what they would do."

On top of this the Authority found from his flight instructors that he deliberately tried to fly into a thunder cloud on one occasion and had insisted another time in renting an airplane to fly in weather which was below minimum requirements. That was enough for the Authority, which found:

"From the entire record in the proceeding we find that petitioner, since receiving his first driver's permit, has demonstrated a singular disregard for the laws of Massachusetts and New Hampshire, particularly those dealing with the operation of motor vehicles, and has persisted in defying the legal authorities of those states. We further find that these same tendencies, prior to our denial of his application for a private pilot certificate, were *becoming evident in his operation of aircraft.*—(Italics mine—Author.)

"Section 602(b) of the Civil Aeronautics Act requires us to issue an airman certificate to an applicant thereof if we find that he is properly qualified for, and physically able to perform the duties pertaining to, the position for which the airman certificate is sought.

"We hold that the petitioner does not at this time have such qualifications, not because he is unable to pilot an airplane with skill, for the evidence is that his mechanical skill is above average, nor because he has established a consistent record of violating the regulations dealing with the operation of aircraft, for no such violations were charged or proved in this proceeding.

"The petitioner's deficiency lies in his lack of mature judgment, his tendency toward recklessness, his lack of respect for laws designed for the protection of the public and his attitude of defiance toward those whose duties are to enforce these laws. By reason of this deficiency, the interest of public safety requires us to deny the petitioner's application."

That final paragraph describes the "Deadly Show-Off" more clearly than I have ever heard him described. Of course, Dunbar's case was unusual. But there are accidents happening all the time which indicate that the same recklessness, lack of respect for law and other deficiencies attributed to Dunbar are pretty widespread.

"Pilot Stout held a student permit," says a typical report of the Air Safety Board. "The pilot and his passenger took off . . . for a local flight. Upon reaching an altitude of 2,500 feet the pilot, while executing a gliding turn, inadvertently stalled the aircraft, which then entered into a spin. The aircraft continued in the spin until it crashed in a nearby hay field. The impact resulted in serious injuries to the pilot and fatal injuries to the passenger. The pilot said that he made several attempts to recover from the spin, and in each attempt the operation was unsuccessful. Other airmen who had flown the aircraft reported that in previous spin maneuvers it had recovered normally."

The contributing factor to the accident was given by the board as "inexperience of the pilot." A passenger lost his life because an inexperienced pilot violated the Civil Air Regulations by taking him aloft. The pilot suffered serious injuries because he hadn't developed, from practice, the necessary skill to avoid stalling the airplane and, once it had stalled and begun to spin, to recover from the spin. His injuries were not entirely his own fault, because he was flying a ship which *would* spin and stall; but, on the other hand, it might not have happened if he had been alone in the ship without the extra weight of the unauthorized passenger.

Students and private pilots are by no means the only ones who violate regulations. They are in the majority, but the Air Safety Board constantly is being called upon to investigate accidents in which pilots of wide experience have shown that they sometimes were just as careless, or deficient in respect for the law, as any inexperienced youth. Last January a commercial pilot with considerable experience took off from an airport in New York with a student. A few seconds later the instructor was dead and the student was lying seriously injured in the shattered remains of the airplane. The cause:

"Upon reaching an altitude of approximately 50 feet over the south edge of the field, a steep diving turn was made toward an automobile occupied by two persons. . . . . As the pilot pulled out of the dive, the leading edge of the right wing tip struck the rear of the automobile, practically demolishing the wing structure. . . . The evidence indicates that vehicles frequently used the path across the south edge of the airport and that on past occasions (the pilot) had been known to dive his airplane toward such vehicles."

The danger to innocent people on the ground from pilots who fail to observe the simple rules of safety is beautifully illustrated in the board's account of an accident in California, in which a private pilot with 250 hours to his credit and a friend of his were killed.

"Soon after the take-off," the inspectors reported, "the pilot was flying low and waving to friends at a restaurant, located on a main highway which is bordered on both sides by trees and utility lines. The pilot made two circles to the left around the restaurant, gradually losing altitude. While banking steeply, the aircraft was nosed down into a shallow power dive, when the right wing collided with the top of a power line pole, causing the plane to fall out of control, strike the paved highway and rebound up a bank where it came to rest. Both the pilot and the passenger were fatally injured and the aircraft was completely destroyed. . ."

The implications here are obvious. If that airplane had dived into the res-

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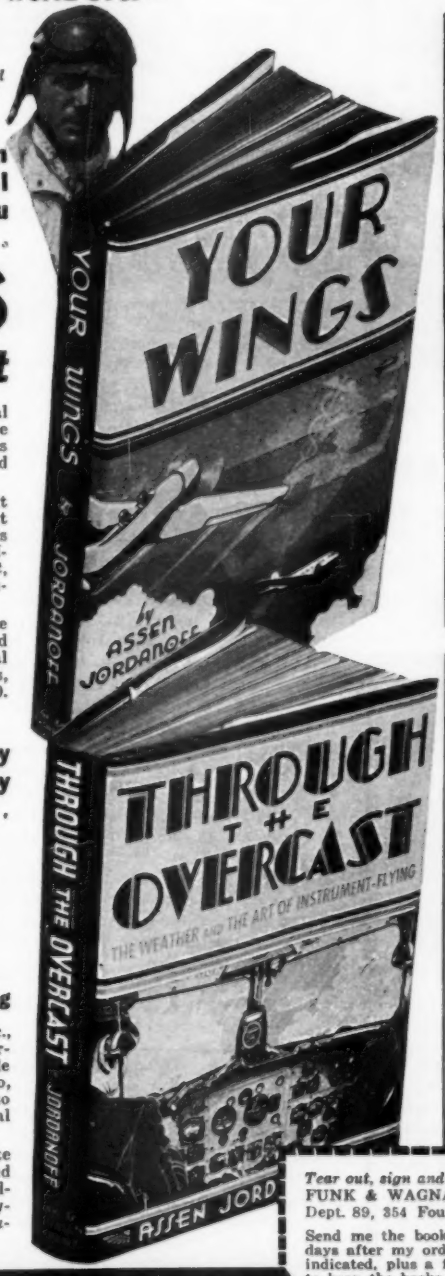


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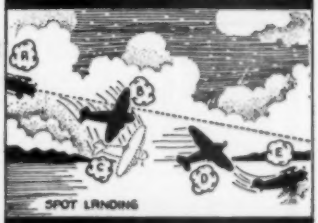


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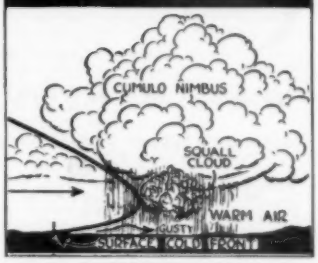


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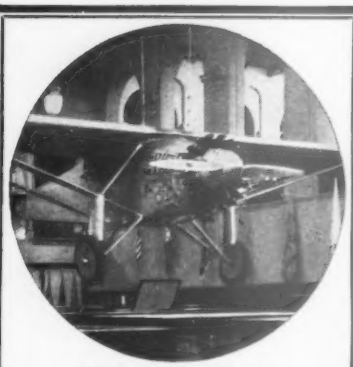

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taurant, several people besides the pilot and his flying mate might have been killed or injured seriously. If a school bus had been passing along the highway, the result might have been even worse. In either case, the black eye to private flying which resulted from the original accident would have been even more of a stain.

**(To be concluded in the July issue.)**

## Shopping Tour

(*Continued from page* 14)

partly-owned first-line craft of the Army or Navy can be manufactured out of the United States. Secondly, foreign governments must cooperate with America, after buying these 11th-hour planes, and report on their performance under *actual combat conditions.*

Woodring succinctly summed up his arguments thus: whopping European orders will (a) assure our own air force of more modern equipment; (b) boost plant capacity.

Aviation inflation *is here.* But, wisely administered, it will—as Maj. Vic Bertrandias, Douglas foreign sales vice-president says—result in cheaper and better planes for the United States.

How the industry has met this demand for more, more and more warcraft offers a likely picture of things to come. Take brand new plants. Down at Hawthorne, Cal., in a big field where clover and sagebrush grew less than six months ago, a pioneer has re-entered the aeronautics game. He's John K. Northrop. Back in 1916 he started as a prodigy engineer just turned 19. Today his lethal creations fly for the United States and many a foreign air force.

Today, thanks to a Norwegian order for pontooned attack-bombers, his backlog already has touched $2,500,000. He has a $500,000 factory, scientifically designed for 300 per cent expansion if the need arises, a wind tunnel as large as that of the California Institute of Technology; and plans for four warplanes. One of these, a "radical, twin-engined attack-bomber" will appear in one-third, flyable size next month. General Arnold spent two hours watching tunnel tests of this job.

Out of thin air, as it were, Northrop has created a potential airplane "mill" from which can be ground scores of ships a month. He will hire 2,400 men. As the industry burgeons, the ever-growing practice of "farming out" parts contracts grows. To this policy Northrop owes much. His new factory cut its teeth on an $850,000 order for tail-assemblies from Consolidated. Into the picture comes talk that Bendix will expand in the west. New business for such bustling concerns as Solar in San Diego and Aircraft Accessories to the north. Shops that make hydraulic equipment, forged apparatus, exhaust manifolds—and all the impedimenta of modern, metal aircraft.

Behind the scenes still other concerns rush production of wire braces, mighty machines that cut and pound and slice, X-ray equipment to inspect parts, tanneries and plastic makers. It's a complicated process; but it's one that is spurring ahead and progressing as only business can impel it.

Besides the political-physical barriers to satisfactory fulfillment of the dream of the Billion-Dollar Baby, we must pose still a third—labor. Possibly 60,000 employees draw weekly paychecks issued by aviation manufacturers.

More engineers and skilled craftsmen are needed. In some instances they are desperately needed. Lockheed prsonnel executives spoke recently of actual "labor piracy" in the aeronautical field. As a result, Lockheed inaugurated America's first factory apprentice system whereby youngsters will learn-while-they-earn. They'll become familiar with the vital, specialized trades without which aviation would perish. You can't build planes without skilled men any more than you can fly a mighty fleet without trained pilots—as nations are learning to their sorrow. . . .

Back to our parable, we might speculate on new, unusual "foods" for Mother Aviation's prodigious infant. Maybe plastics will be a good diet: stamped-out ships that will roll from giant presses like Grandma's cookies.

Figures disclosed by Major Stromme set Britain's output at "approaching 800 a month", France's (owing to the muddled politico-economic-labor situation) stands at a "pathetic" 250. Meanwhile, Nazi Germany, according to our War Department procurement spokesman, can manufacture a cool 1,500 per month. Some say more.

Small wonder the Allies want planes. Particularly when their amalgamated fleet which could take to the skies at the present time (still quoting Major Stromme) is only 13,500 to Germany's 14,200. Toss in Russia's reputed 10,000 warcraft and you have a picture that's about as pretty as a railway switchyard.

We may get custody of the Billion-Dollar Baby. That the industry wants it is obvious from such statements as that of Mr. Douglas:

"Quantity production of airplanes under a program of coordination with the Government of the United States and in cooperation with other manufacturers is *one of the most important and significant developments in the history of the industry.* Ability and opportunity to concentrate on a few advanced models incorporating the latest structural refinements and highest possible performance will give the aircraft industry, and through it our national defense, a great reserve of airplanes that can be built *better, cheaper and faster* than we have been able to build them before.

"World events have demonstrated the importance of the airplane in the affairs and safety of nations. In the light of recent developments, it is our duty to be a nation prepared and efficient to meet the challenge of the times."

It is the opinion of expert aviation industrialists who converged on Manhattan recently to dicker with hard-headed Allies buyers, that the mighty infant can be cared for.

END

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(Please check your answers in boxes)

1. Do you plan to fly when the flying weather report reads?*
   X E3⊕IRF 50/50↑5 996 BRDS WLKNG
2. Are you a licensed pilot? [Yes] [No]
   Are you a student pilot? [Yes] [No]
3. Do you own or plan to own your own plane? [Yes] [No]
   If not, check one of the following to indicate how you plan to get time. Renting a plane ☐ As a member of a flying club ☐ As a professional pilot ☐ Friend's plane ☐ Not flying over 10 hrs. a year ☐.
4. If you rent a plane and hit somebody or damage the ship are you liable? [Yes] [No]
5. Do you ask if the equipment you fly or fly in is insured? [Yes] [No]
6. Do you think Aviation Insurance is costly? [Yes] [No]
7. Why do planes land faster in warm weather? .....
8. If you own an aircraft do you regularly receive the factory bulletin? [Yes] [No]
9. Is there an increased tendency to stall during a downwind turn? [Yes] [No]
10. Have you ever been personally approached to buy aviation insurance? [Yes] [No]
11. Would you fly in an uninsured aircraft? [Yes] [No]
12. Does the expression "reversed controls" mean the same thing as "crossed controls"? [Yes] [No]
13. Is the stick ever pushed forward while taxiing? [Yes] [No]
14. On a civil airway, is a flight plan ever required for a private pilot? [Yes] [No]

*These weather symbols (see WEATHER SYMBOLS) mean: Airport closed. Ceiling estimated 300 feet, overcast; visibility one mile, rain, fog. Temperature 50, dewpoint 50, wind south five. Altimeter setting 2996. Birds walking.

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## Aviation's Patron Saint

(*Continued from page 42*)

time to run the locomotive on his own Santa Maria Valley railroad; time to build and operate science cruisers, the newest being the *Velero III;* time to cruise the Pacific from the Galapagos to Alaska.

During the past few years, he has spent some time flying around the countryside in his Beechcraft but his preferences, because of their capacity and his familiarity with them, are the Lockheeds. He first purchased the "12". He soon found he wanted to carry more friends, so he bought the "14" and now can carry 12 passengers wherever he wants to with the 4-M land rating which he holds.

Jim Barwick, who has been with him on his flights since the purchase of the "14" in December, 1938, pays him two tributes. Barwick, former motion picture stunt pilot now testing for Lockheed says:

"He is the finest pilot I have ever seen under the hood. He is the most thorough man I've ever known."

Barwick also reports that the captain has a stamina equalled by few professional pilots.

"First of all," he declares, "the captain spent an entire month testing the airplane, finding out just what it would do under all conditions and shooting landings until the ship handled like velvet. When he got through with his tests, which included climbs, single-motor performance and everything else he could think of, he felt ready to his CAA examinations.

"The inspector reported him one of the most skilled pilots with whom he'd ever flown."

The captain handles the controls all the way on every flight which he makes, as well as working out all navigation problems. Last summer, when he flew to Dayton to discuss the establishment of the Army school at Santa Maria, he flew steadily for eight hours. He conducted his business at Dayton and then flew back.

"During the entire trip," Barwick says, "he was never more than two miles off his course in spite of at times far from ideal weather conditions."

Another record which a younger man would find it hard to beat lies in the fact that never, during his flying of heavy ships, has he ever over-shot any field he attempted to enter. But, most important, not only does he find time to fly but to help scores of young men to gratify the same ambition, not only patronizing, but by helping them to help themselves. The money he has invested in training American youth to fly he won't discuss—but it's all summed up in the statement, "my interest in such training is far more patriotic than commercial."

END

**HANCOCK, G(eorge) Allan,** banker, oil operator; b. San Francisco, Calif., July 26, 1875; s. Maj. Henry and Ida (Haraszthy) H.; father a Calif. "49er"; ed. Brewers Pvt. Sch., San Mateo; student Belmont (Calif.) Coll.; Dr. Bus. Adminstrn., U. of Southern Calif.; studied navigation and licensed as master mariner; also licensed by Dept. of Commerce holding a transport pilot's license; m. Genevieve Deane Mullen, of Los Angeles, Calif., Nov. 12, 1901; children—Bertram Deane (dec.), Rosemary (Mrs. John Stephens Zeiser). Organizer La Brea Oil Company, 1900; organizer, with others, 1909, Hibernian Bank of Los Angeles, reorganized as California Bank, 1920, of which is 1st vice president; organizer and pres. La Brea Securities Co.; chmn. bd. Calif. Trust Co.; pres. Rancho La Brea Oil Company, Santa Maria Valley R. R. Company, Rosemary Packing Company, Santa Maria, Calif; vice president Santa Maria Ice & Cold Storage Co. First pres. Automobile Club of Southern Calif.; pioneer in good roads movement; mem. Greater Harbor Com. of 200. Mem. Nat. Aeronautical Assn., Am. Petroleum Inst., Los Angeles Chamber of Mines and Oils, Yachtsmen's Assn of America. Republican. Clubs: California, Gamut, Los Angeles Athletic, Calif. Yacht, Wilshire Country; financial sponsor trans-Pacific flight of the "Southern Cross"; and in May 1929, established the Hancock Foundation College of Aeronautics, at Santa Maria, Calif.; sponsor of annual Hancock scientific expdns. and Hancock Ensemble. Donor of 25 acre park to Los Angeles, comprising Rancho La Brea Fossil Pits, from which rare remains of Pleistocene animals have been recovered and presented to Los Angeles Museum. Address: 6381 Hollywood Boul., Los Angeles, Calif.

*Who's Who in America, 1938-1939.*

## Cloud Club

(*Continued from page 43*)

which Minnesota is famous as potential landing areas, a ship with pontoons would never be far from a safe landing in any part of the state or neighboring Wisconsin. Mr. Melin looks forward to carrying a fly rod along in the summer and fishing from the cockpit, as these lakes are full of game fish.

Winter did not ground the Cloud Club, for these same lakes provide fine landing places when frozen and are being used by many flyers who land on the ice for a visit with friends or ice boaters. Activities of the club include participation in the "breakfast club" good will flights of St. Paul businessmen to various small towns around the state. These trips are arranged for Sunday mornings when the pilots fly en masse to some designated town where the local members meet them at the field and take them to a hearty breakfast and, in turn, the visitors take up those among their hosts who are in-

terested in a ride. Outstanding of the trips made, to the flyers' memory, is the journey to Center City, Minn., about Christmas time, where they had a three-mile-long lake for landing and a turkey dinner with trimmings, instead of a mere breakfast.

Practically every holder of any kind of license from dual on up makes these good will flights. Club members who are not scheduled for their ship on the Sundays the trips are made, rent or borrow planes so that usually the entire roster of Cloud Club is on hand when it comes time to eat. About 18 ships ordinarily turn out for these excursions.

The reaction of the Twin Cities' air-minded to this flying experiment is shown in the reorganization of the old St. Paul Flying Club, formation of Skyways, Inc., the Gopher Flying Club, Minneapolis Flying Club and an as yet unnamed club in Minneapolis, all using the articles of incorporation of the Cloud Club. Interest in aviation about the state has been stimulated by this project as is attested by the number of requests for information coming into Cloud Club members from people in other cities.

Charter members of the Cloud Club are: Alton Oberholtzer, club president and a law student attached to the legal staff of a large corporation; Roy Proebstle, vice president and a buyer for a mail order house; Alvin Krueger, secretary-treasurer, a bookkeeper; Arnold Melin, finance and purchasing, an accountant; Andrew Potter, a bookkeeper; Walter Malmstead, retail salesman; Barney Larson, laboratory technician; George Curney, retail salesman; Theodore Tudisco, assistant manager of an oil station; Hamilton Ford, oil station attendant; Ben Loague, Jr., salesman; and Henry Dieman, postal clerk.

One Cloud Club member dropped out when he was seriously injured while tobogganing. He needed his money for hospital expenses. He vows that when his finances are clear again he will stick to flying and shun the more dangerous sports.

END

## AOPA News

(*Continued from page* 54)

At Seattle stopped to chat with Frank Yates, who manages Boeing field. Spent an hour with the boys in the control tower there and watched 200 landings and take-offs in the period. Never saw a better disciplined group of pilots. Met Joe Crosson, the great Alaskan pilot here. He says that Pan American Airways will connect Seattle and Nome with flying boats by May.

* * *

We can report definite progress in our plans to work out a cooperative scheme between AOPA members and the American Red Cross. The Susquehanna river flood back east illustrated the sort of situations in which AOPA members could be of considerable help as scouts, as rescuers, and as deliverers of supplies. It happened that, through good fortune, nobody was in need of aircraft during the flood, although Abby Wolf, who has a pontoon job on the river, was much perturbed because he wasn't given a job of helping. His plane would have gotten along well on the Wyoming Valley airport during the flood. He could have taxied right through the skylights. Local authorities appreciated his volunteering, but just didn't have anything for him to do. But they did appreciate the possibilities that were opened up to them by the use of a plane and pilot and may assist us in our work at Red Cross headquarters. A sound scheme like this really takes time to complete.

* * *

AOPA had a chance to hear Grove Webster take his hair down about the civil pilot training program. Here's the gist of his thought on the subject to date:

A total of 230,000 hours have been flown, and some 65 per cent of the program completed. Records show that this controlled training has been from 25 to 30 per cent safer than ordinary training at non-controlled airports. There are now 511 centers having this flight program. The program has been most successful where the numbers of students have been in 10-20-30. Where the units have been larger the training has not progressed so satisfactorily.

In the future there will be a greater spread in the program. The concentrations will not be so great so that more communities will have units. It is expected that 650 airports will have the training next year. *Also there will be an increase in non-college units at the expense of the college.* This is in line with AOPA's recent recommendation. Some of the college stu-


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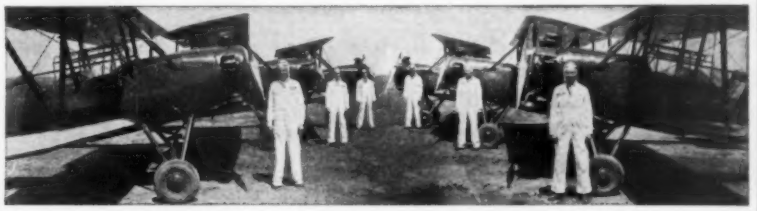

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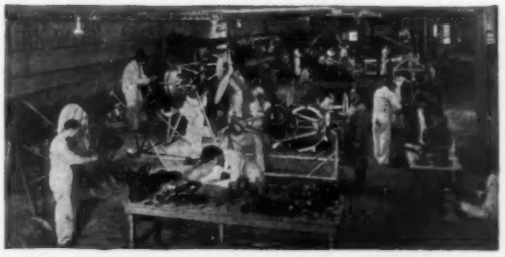

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dents have gotten pretty cocky about the training. Some have been indifferent. In some instances there has been a cutting of ground school and even of flight training by these students. This has resulted in their failure to pass some written examinations.

Virtually in every instance the program has resulted in raising the standards of the airport and operators where it has been installed. It is Webster's opinion that a larger group of persons should be given primary training rather than heavy participation in advanced training courses. *One advanced student cuts out 2½ primary students.* Only about 5 to 10 per cent of the grand total should be in advanced training.

In the future it is hoped that some element of competition can be arranged in the training institutions. This should make for a better selection of college students. The program, after all, is not a subsidy but an educational opportunity. Webster expressed the opinion—his own and not at all officially speaking—that the government should not give additional flying time to a man once this individual has been trained to the grade of private license.

Of the 313 original students who were granted private licenses, 267 answered a questionnaire recently. Eighteen had joined the Army Air Corps, 13 t e Navy. A total of 3,000 hours had been logged by 220 c f them since receiving their certificates in June of last year.

Approximately 500 of those taking the flight course at this time have completed the training. On last April 10 7,700 had completed A stage; 5,600 had completed B stage, and 2,000 the C stage. The only real trouble had come from flying outside the program. One student lost his life when he engaged in outside flying in a different type of craft than those with which he was familiar.

* * *

We have just received a review copy of Lewin B. Barringer's new book—*Flight Without Power*. It's probably the best treatise on soaring that we have seen, and certainly the most solid, helpful and comprehensive. Barringer, who is an AOPA sponsor, seems to have put the cream of his years of experience in soaring into its pages. He's assisted by Paul and Ernest Schweizer and Milton Stoughton in certain chapters dealing with aerodynamics, design and construction. Dr. Karl O. Lange has a chapter on soaring meteorology; Charles H. Colvin does the work on instruments. It's published by Pitman and now is on sale. Read it even if you aren't interested now in soaring. You will be interested when you're through the book.

END

## Flying and Nerves

(*Continued from page* 19)

to come out to the field regularly. Late one summer afternoon he arrived looking tired, haggard and old beyond his years. He told me that he had performed no less than 12 major operations that day and that his nerves were ragged. After strapping him in the front seat of the "F", I took off and climbed to 8,000 where I throttled back and cruised slowly around the tops of some beautiful, billowy white cumulus clouds. This was a new experience for him and I could see him glance from side to side with almost childish delight. Finally I throttled back and as we glided silently down through those cloud canyons I could see his face begin to relax as he wore an almost continuous smile. After we landed he told me that it had made a new man out of him—and he looked it!

This same reaction can be achieved by pilot as well as passenger. I have several private owner friends who tell me that after a hard day at the office they go out to the airport for half an hour to an hour's flight and come home to dinner feeling definitely refreshed and relaxed. I have often experienced this myself, given an airplane to fly that was neither "too hot" nor too powerful with consequent noise and vibration undoing the good caused by the pleasure of the flight. Although I get a kick out of flying a new North American O-47 with a 1,000 h.p. engine under my feet, I don't feel relaxed after landing the way I do after having flown a comfortable, stable ship with only 100 h.p. or less and a slow, safe landing speed.

When not just playing around with local flying as a means of relaxation, but going on a long, all-day cross country in good weather, flying is much less of a nerve strain than the same number of hours behind the wheel of a car. One clear winter's day two seasons ago I flew a fast cabin ship from Miami to Philadelphia between breakfast and tea-time with only two brief stops for fuel and food. The distance is around 1,200 miles, the flying time just over seven hours. I was far less nervously exhausted than when driving a few weeks later from Washington to Knoxville, a distance only a third as far but taking twice as long. I did half the driving so it is a fair comparison.

For real pleasure and relaxation in the air, however, give me a sailplane any time. One of the principal reasons for nerve fatigue in airplane flying is the engine noise and vibration. The best of them are still far from the quietness and smoothness which we have come to know and expect in our automobiles and which we can and must have someday in airplanes. With a sailplane, in addition to complete absence of vibration and the

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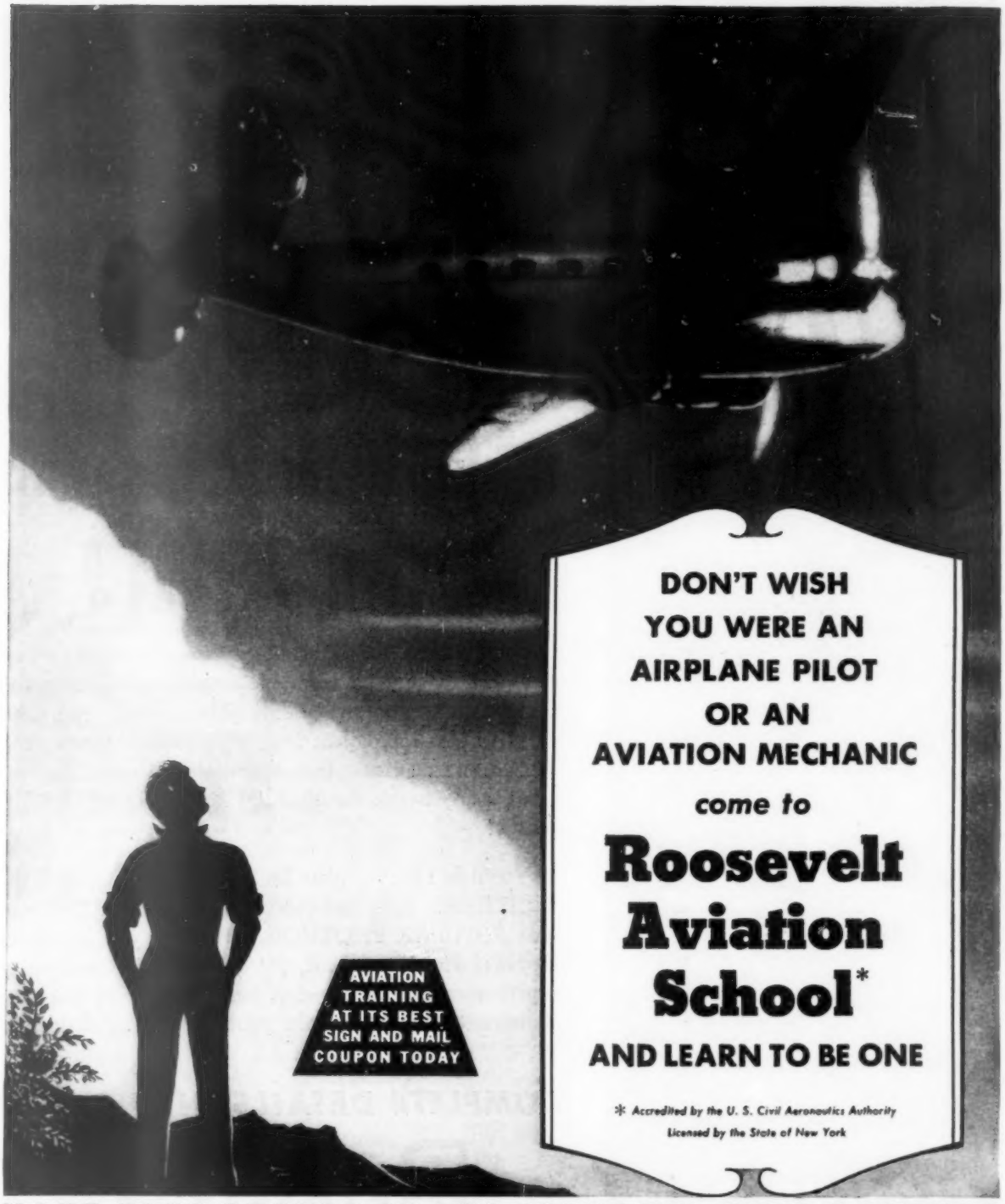


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noise merely a swishing of airflow over the cockpit enclosure, you have the pleasant feeling of flying a ship with a very low sinking speed, remarkably flat glide which will take you from 20 to 30 miles from an altitude of 5,000 feet and last, but certainly not least, the ability to land in very small fields.

I don't want to paint a too perfect and consequently untruthful picture. High performance distance and altitude soaring for contest and record purposes is an advanced form of flying requiring plenty of skill, good judgment and "being on edge" with consequent nerve fatigue. However, when just playing around in one vicinity either slope or thermal soaring it is quite possible to relax and enjoy oneself to the utmost. Out in Texas, where I spent a month in the spring of 1938 determining the possibilities of thermal soaring over level country, I used to lean back, shut my eyes and completely relax for a minute or two at a time while my big, stable wooden bird continued to spiral lazily at 2,000 or 3,000 feet. Yes, I know lots of ways to get nerve relaxation and refreshment in airplanes, but if I have my choice I will pick a plane that flies without an engine. The ideal solution is the high performance two-seater as Jack Brookhart and I proved on our record distance flight for this type last summer. During four of the pleasantest hours I have ever spent in the air we alternated at the controls every so often, one flying while the other rested.

Some of my friends will read this informal dissertation on the effects to nerves of flying and say that, to even think of the subject, I must be getting old or something. I venture to say that if they will thumb back through their log books they will remember times and places and come to agree with me that, under certain circumstances, flying can be as beneficial to human nerves as it can be wearing.

END

## Rotary Wings

(*Continued from page* 55)

relative air direction plotted against the angle of attacks. The airfoil selected is the N. A. C. A. 23012. Assuming a two degree angle of incidence of the blades, the angle of attack for the advancing blade will be five degrees and, for the retreating blade, seven degrees. From the diagram the angles of the resultants will be 1.6° and 2.7°. Subtracting the respective angles of the airstream we find the resultants at a minus angle of 1.4° and a minus angle of 2.3° respectively from the axis. The negative angle indicates an anti-drag or a thrust component. At the points A and B the resultants will give drag components. In order to have steady self-rotation or auto-rotation, the sum of all drag forces must be equal to the anti-drag forces. A sketch in Section 5 shows how a thrust originates on a rotor blade.

In Section 4 a polar diagram of the lift and drag coefficients of the N. A. C. A. 23012 are plotted. The lift coefficients are evaluated for the 3/2 power. This polar diagram indicates the minimum power required or the best sinking speed obtainable if a tangent is drawn from the drag of the shank to the curve. It shows that the angles range from 6° to 12°.

The lower sketch in Section 5 shows the resulting air speeds of a helicopter. The rotorplane is at negative incidence to the direction of flight. This indicates larger blade angle settings must be employed to obtain the necessary lifting power. The forward component of the resultant is the propulsive force that must be equal to the resistance of—Copy does not read on.

The polar diagram in Section 4 shows that, with a slight increase in power, a greater amount of lift is obtained. The maximum lift possible with a helicopter, if the diameter of the rotor is given in feet and the power output of the motor is known, is given by the equation in Section 5.

The angle of attack can be increased to give more lift and raise a drooping blade as shown in the upper sketch in Section 6. Under some conditions the opposite may be necessary. However, the unequal lift of the retreating and advancing blades gives one solution for controlling a helicopter. It is used on autogiros, but is very effective on a twin-rotor helicopter standing still, hovering.

The resultants of the two rotors are eccentric and inclined as illustrated in Section 2. This condition will give an inherent stability to the helicopter, a dihedral effect.

A small sketch in Section 6 depicts a design that reflexes the angle during rotation. A spring keeps the blade with its roller pressed to the inclined plate or cam, that gives the blade a sinusoidal motion. The blade or vane is rotated about its aerodynamic center. Moving the inclined plate upward the maximum angle of incidence is decreased;

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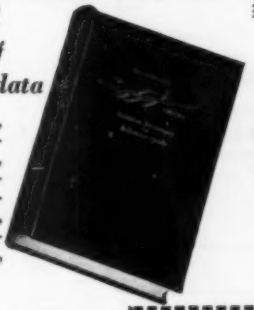

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moving it downward, the angles are increased. Turning the cam, the position of the maximum angle or the center of pressure is moved on an arc forward or backward. A sketch and a table in Section 6 show the location of the cam for controlling a helicopter; with additional tail surfaces, it can be controlled at any speeds.

The rotors of a helicopter should be driven by inclined shafts that are interconnected by bevel gears, operated by an engine through a friction clutch. In case of engine failure the clutch is disengaged, the rotors set at a smaller angle of incidence to be able to self-rotate and the ship lands as an autogiro.

Obviously it may be assumed that the air moves upward through the rotor of an autogiro and downward through the rotor of a helicopter and that a critical condition may arise when the engine stops. However, close examination of the vector diagrams shows that the air acts in both cases in the same manner, except that the angle of incidence differs. Usually the clutch is connected with the setting of the blades.

Theoretically, the helicopter should not only lift more load per horsepower but should also give higher speeds than a conventional airplane.

END

## Push-Puller

(*Continued from page 28*)

of entrance into the two seats, now requiring use of a small ladder, will be overcome on larger planes with a stairway built through the floor. Landing visibility, good from the front seat, is poor from the rear.

"Gliding models proved to be stable with a center of gravity range of 19 to 32 per cent of the mean aerodynamic cord of the wing," McKellar said. "Conventional modern planes with tails have a range of 16 to 36 per cent. Thus, for the flying wing the center of gravity travel is limited to 13 per cent of the mean aerodynamic cord as against 20 per cent for the conventional airplane."

Fuel tanks are in the wings. Disposable loads can be carried at the approximate center of gravity. McKellar described the carrying capacity as tremendous in larger models that eventually would have wings six feet or more in height. Beside the gliders, a one-third scale model with two one-fifth horsepower motors was used. The tests showed a tip stall, which is corrected in the present design by decreasing the angle of attack 3° at the wing tips.

The plane has a tricycle retractable landing gear similar to that of latest type planes. There is a steerable wheel at the front. Students in their regular class and laboratory periods have carried out details of design and construction. McKellar, a graduate in engineering at the University of South Dakota who came to California Polytechnic in 1937, previously has served as an aeronautical engineer for the National Advisory Committee for Aeronautics and the Hughes Aircraft Company.

END

## Airy Chat

(*Continued from page 4*)

based on luck. Good common-sense, sound operating practices did it and if they worked perfectly for one year we see no reason why they can't do so indefinitely. But air travel never will become universally used if air passengers are told they are lucky to have come down alive.

* * *

REMEMBER what we said last month about poor public relations in the private flying end of the industry? The following brings us up to date: we wrote a certain manufacturer several times, requesting a photograph of one of his airplanes so that his product could be publicized in the POPULAR AVIATION DATA BOOK, which starts on page 44 of this issue. Finally, after holding us up for nearly three weeks, the picture arrived—with a bill for 50 cents!

* * *

WE come across many little items each month, each of them not worth a full paragraph by themselves. So let's put them all together from now on and call it the What's-In-The-Wind Department. Here goes: Several moneyless private aircraft manufacturers are planning a sort of aeronautical General Motors with tentative headquarters in Chicago . . . some smart Army officer has developed a ground speed indicator for aircraft that's supposed to be a bell-ringer; has to do with cutting lines of force from the earth's magnetic field . . . all that recent stuff about a reversible-pitch propeller surprises us; Hamilton-Standard had one on an airplane at least 10 years ago . . . don't be surprised if Pan American Airways lays some cash on the line for the commercial version of the Douglas B-19 (see page 15) . . . guess the the British worked a little too fast trying to switch their airline pilots from old wartime crates to modern flying boats; 14 of the original 39 four-engined Empire boats (*Cavalier* was one) already are washed out . . . we like Walter Winchell's retort: "I'd rather please all of my readers some of the time than some of my readers all of the time" . . . Bell's P-39 may be redesigned into a two-seater . . . Glen Angle's new "Aerosphere" is a terrific 11½ pound, 1,420-page world aviation directory containing 2,055 illustrations and listings of practically every conceivable branch of the aviation world—and it's a wow . . . so is Lew Barringer's "Flight Without Power" (also see page 18) . . .

* * *

TOOK us almost two years to get "The Deadly Show-Off". Two years, of course, before we finally turned the assignment over to John C. A. Watkins, Esq. of Baltimore. Being a recently-soloed pilot and aviation editor of the Baltimore *Sun* long enough to know a screwball flyer when he sees one, Watkins went after our article with a vengeance. We—and the C. A. A.—have high hopes that flyers themselves will wipe out this sort of flying by reporting any and every violation of the regulations they witness.

Now for the July issue . . . M. K.

END


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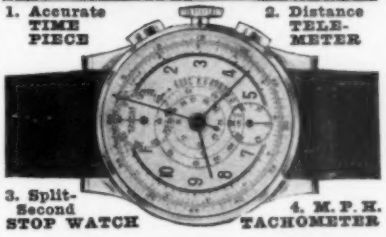


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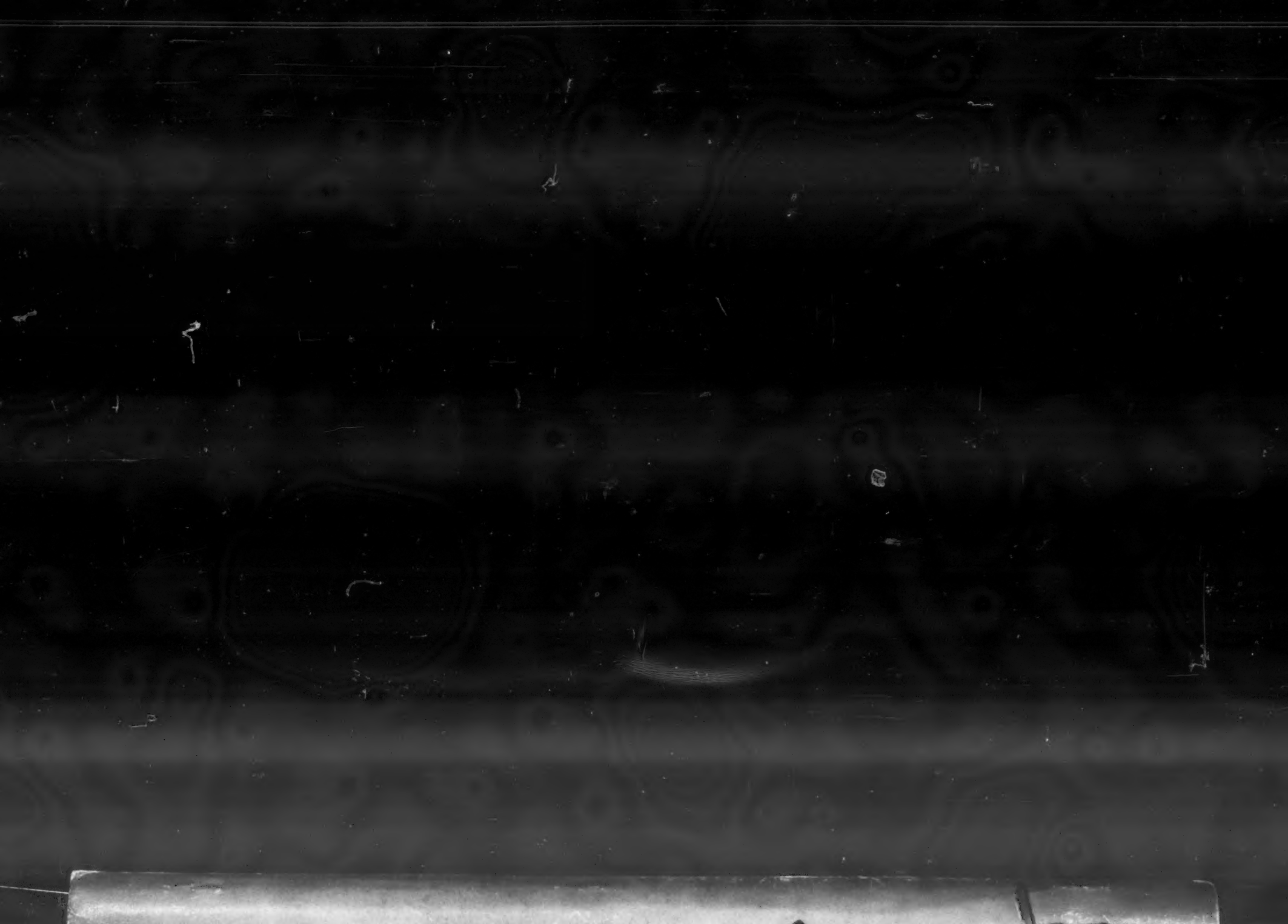
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